RCA Broadcast News

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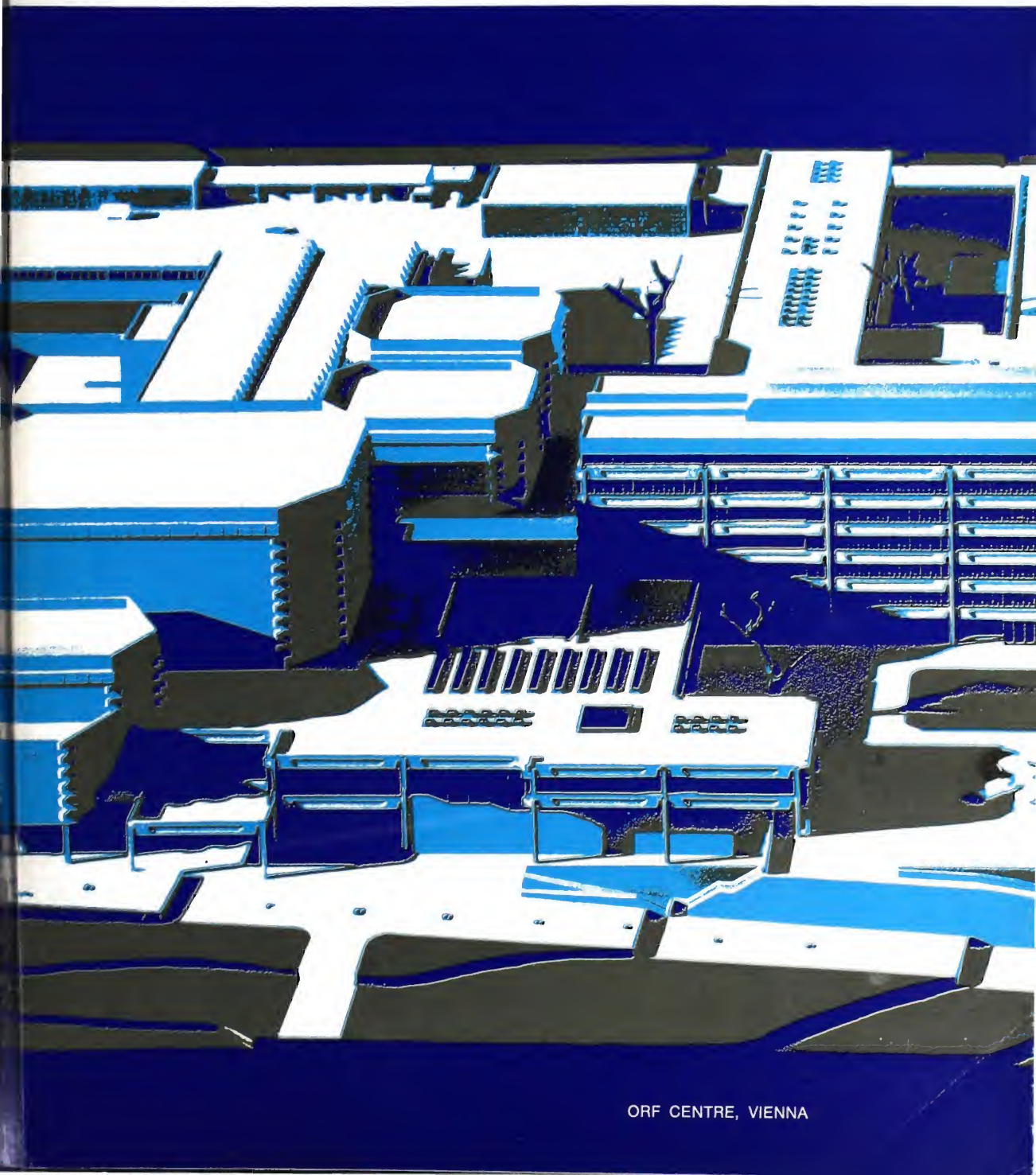
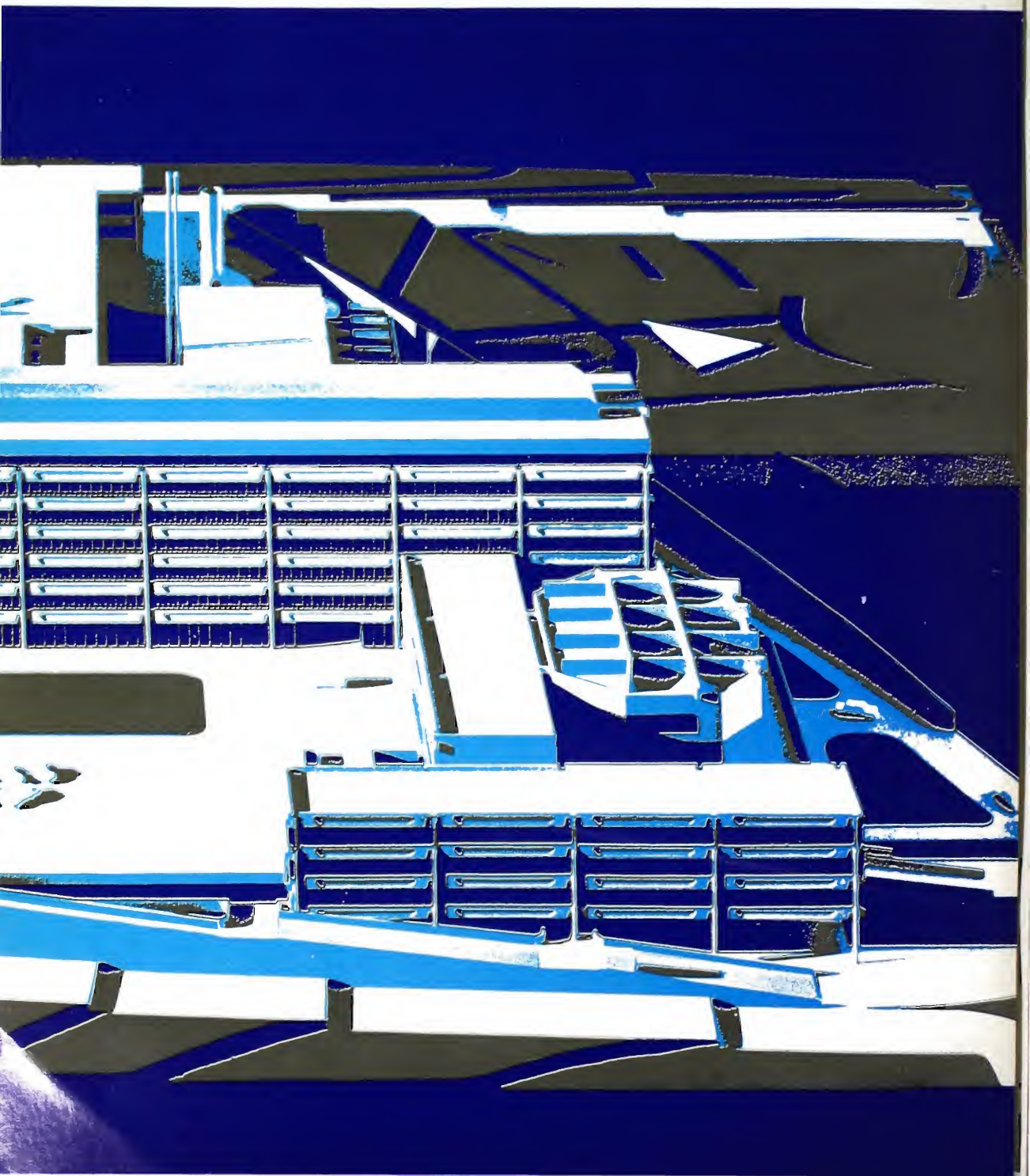


ORF CENTRE, VIENNA



MARCH 1972 VOL. NO. 147

RCA
Broadcast News

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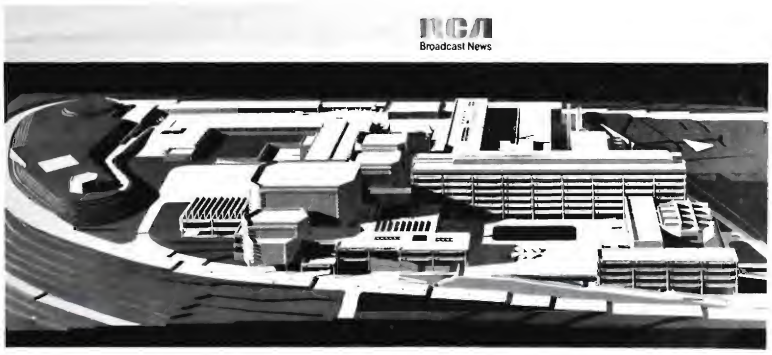
OUR COVER—The model for ORF's "Vienna Central". This mammoth tv center, due for completion in 1974, sprawls over 27 acres and will contain 900,000 square feet of working space to house all of the tv operations of the Austrian Broadcasting Company (Osterreichischer Rundfunk).



IN THE VIEWFINDER

TR-70C's Help West Germany's First Earth Station Produce Color Programming Via Satellite

Two RCA TR-70C Video Tape Recorders are working in the control center of Raisting, West Germany's first space communications complex. They provide the country's television stations with a new dimension of participation in overseas color telecasts. Primarily, they feed video taped programs to the station's transmitter for international distribution via satellite and store incoming satellite information for presentation to Germany and other European nations on a delayed basis. Programs received from other countries operating on NTSC standards (525-lines, 60-Hz), such as the United States, Canada, Japan, The Philippines, etc., are recorded on one of the TR-70C's. Then the signal is changed to PAL (625-lines, 50-Hz) by a scanning converter and sent to the other VTR, which makes the final program tape. Since the TR-70C offers switchable standards as a basic feature, the procedure is reversed when a locally-taped event is relayed to NTSC-countries and is performed along with a direct feed to the satellite when a simulcast to NTSC and PAL countries takes place. When the international hookup consists of PAL-only countries, the transcoding equipment is bypassed.

Besides providing an efficient means of handling programs involving satellites, the RCA units have become a source of new revenue for Raisting's management. This is because Germany's two largest television networks, the ARD and the ZDF, have increased their reliance on them for the standards conversion of TV tape productions purchased abroad for colorcasting in West Germany. It is also planned that they will be used for

Communications complex at Raisting Earth Station, Upper-Bavaria, West Germany.

Master control room monitors and regulates all operational traffic on a 24-hour a day basis.

delayed telecast at the Twentieth Olympiad in Munich, due to the time difference between Germany and other parts of the world.

The "Deutsches Bundespost" started construction of the earth station at Raisting, Upper-Bavaria, in 1963. The complex began commercial communication on June 28, 1965, after a period of trial operation with both the "Relay" and "Telestar" satellites. Since the first "synchronous" satellites had limited capability (bandwidth for only 240 telephone circuits, or 1 TV channel), they could link but two earth stations simultaneously. Therefore, Raisting shared its role as the central message center for Europe with stations at Pleumeur Bodou, France and Goonhilly Downs, England. With the orbiting of the "Intelsat" series, the multiple access concept of several sites using one space platform at the same time was realized—"Intelsat IV" has channel space for 6,000 telephone conversations or 12 television channels.

When a second antenna was commissioned at Raisting on October 13, 1969, it was placed into transatlantic service, while the first was oriented toward the East. "Antenna I" uses the Indian Ocean space vehicle, "Intelsat III" for two-way links with Japan, Thailand, Indonesia, Kuwait and Australia. "Antenna II" provides duplex operation with the United States, Argentina, Brazil, Chile, Colombia, Peru and Venezuela. A third antenna, to be completed in time for the Munich Olympic Games in the Summer of 1972, will permit connection to other nations.

In its brief history, Raisting has participated in several memorable telecasts. President Lyndon Johnson's inaugural and the Olympic Games in Tokyo were the highlights of the early days of German satellite communication. On May 2, 1965, a historic linking of all existing earth stations was accomplished to allow the premier broadcast of "Around the World", a famous German television program. The boxing match between Muhammad Ali/Karl Mildenberger was transmitted in color from Frankfort via Raisting and "Intelsat I" to the United States early in 1966. The momentous Muhammad Ali/Joe Frazier confrontation was distributed throughout Europe from Raisting in March of last year. Another big color series was the presentation of the Mexico Olympiad during the Summer of 1968. For that event and others, such as the World Cup Soccer Championships, Apollo Missions, etc., an optical color device was used for NTSC to PAL translation. Also in those days, an RCA TR-22 HB video tape machine was used for storage of monochrome and color programs.

Alfecon II and New Rework Process Lead To Long-Life RCA and Mark X Highband Headwheels

Recent developments in RCA factory reconditioning service of video tape headwheels are resulting in a marked increase in headwheel life. The reconditioning features the use of a new pole tip material, Alfecon II, now being used in the rework of all RCA highband headwheels as well as Ampex Mark X highband panels used on model VR-1200 and VR-2000 video tape recorders.

Use of Alfecon II has generally been credited for making the new performance possible. However, equally important is the comprehensive rework process each panel undergoes at RCA.

Upon being received, each panel is analyzed electronically to determine the condition of all its working parts. Among the items checked are motor lockup time, motor bearings, rotary transformer, tone wheel pulse, amplifier (if on panel) and shoe mechanism reseating position. This evaluation also includes an analysis of picture quality if playback is possible.

The panel is then completely disassembled. Rotary transformer parts, control track head, tone wheel head, vacuum guide and carrier, and quadrature plates are completely removed. The panel is completely cleaned, the air bearing system is tested to determine whether air flow meets specifications, and ball bearings are tested on a Smoothrator system.

In the process of reassembly, RCA uses the original parts only if, after thorough inspection, they have been judged to be within new part specifications. Otherwise, they are replaced with new or reconditioned parts. Video heads are 100-percent replaced with Alfecon II pole tip material. Headwheel, and vacuum guides are also always replaced.

Video heads are preset to ±25 microinches with respect to 90-degree quadrature. After the head has been rebuilt, the vacuum guide is positioned on the panel to within 10 microinches of the center line of the bearing. The headwheel is then placed in the motor assembly, and tone wheel timing is readjusted by bench test.

After precise reassembly of the rotary transformer, the headwheel panel is dynamically balanced by a computerized system capable of balancing the panel to within 2 to 4 microinches of displacement eccentricity. A printout records the balance of each individual panel. This dynamic balance procedure was designed and developed at the RCA Princeton Laboratories.

Control track position is adjusted for correct timing with respect to the video head by means of a stop-tape method. A Visimag records the data involved.

The panel is then ready to be incorporated into a working video recording system for performance evaluation. First it is aligned to a standard SMPTE video tape. The heads are then subjected to a final lapping procedure for correct head-to-tape contour. The panel is finally optimized, using as standards: recording multiburst (to check the response of the video heads and confirm playback equalization), nine-megacycle carrier (for drive currents, signal output and signal-to-noise ratio), and color bars (for standard color interchangeability and balancing).

IN THE VIEWFINDER

Ohio State Expands Color TV System For Medical Education

Ohio State University has begun a major expansion of its extensive closed circuit TV system for medical education, ordering new RCA color TV cameras and other studio equipment worth nearly $300,000.

The new equipment, which will occupy two large professional studios, will provide facilities needed to increase production of instructional programs in medicine, according to Robert E. Potts, Director of the Audio Visual and TV center for the University's College of Medicine.

The college produces nearly all of the TV programs viewed by its 1938 students. Its full-color system was inaugurated last year with the installation of approximately $500,000 in RCA cameras, film systems, video tape machines and control equipment.

The college's color programs are distributed by cable to 10 medical buildings and can be seen on more than 170 monitors placed in classrooms, auditoriums, lecture halls, the hospital and the School of Nursing.

The system's nerve center is a master switching and distribution complex, which can relay as many as 12 different programs simultaneously to selected groups of viewing monitors, or send the same program to all sets.

The color system augments a black-and-white one which has been in use at the College since 1966. The first color program was "live" TV coverage of surgery. Pictures were relayed by microwave to a downtown Columbus hote where receivers had been set up for the one-way video and two-way audio presentation.

All such "live" programs include a two-way audio link between operating room and classroom so that students may ask questions during the surgical procedure and hear the surgeon's response.

Mobile Radios Assigned Sea Duty As Communicators of Oceanographic Data

RCA mobile radios normally used in police cars and other land vehicles are serving sea duty 90 miles out in the Pacific Ocean to relay oceanographic data to a computer onshore.
The two-way radios are mounted on three buoys to transmit readings from sensing devices that measure water temperature, wave action, current flow and other factors as part of an Oregon State University research project.

The transmissions are picked up by a receiving antenna on St. Mary's Peak, a 3,000-foot hill in the Cascade Mountains, and relayed by another radio link to the University's Computer Center at Corvallis, Oregon, for processing.

The mobile radios are equipped for duplex operation which provides continuing transmission of data from the buoys while coded instructions are being received from the computer onshore. The simultaneous transmitting/receiving technique insures an uninterrupted flow of information from the sensing devices.

Data transmissions from the sensing devices are activated automatically by tones sent from the onshore computer. The tones select the sensors to be read, and the radio messages begin to flow to shore.

University scientists said major advantages of the system are to make data available for study in "real time" without delays for storage, and to enable investigators to change the sampling rate under varying environmental conditions.

Radio links from each buoy have 32 digital data channels, 32 command channels, three continuous analog channels, and a low speed digital channel. Data acquisition rate from the buoys is 40 samples per second, using 12 "bit" data words.

Located on the buoys are such standard meterological devices as anemometers, barometers, and air temperature and rain gauges. Oceanographic sensors are mounted on an instrument package that is lowered into the water on command from the computer. The sensors measure sea temperature, currents, turbulence, conductivity and oxygen content from the surface to approximately 1,600 feet down.

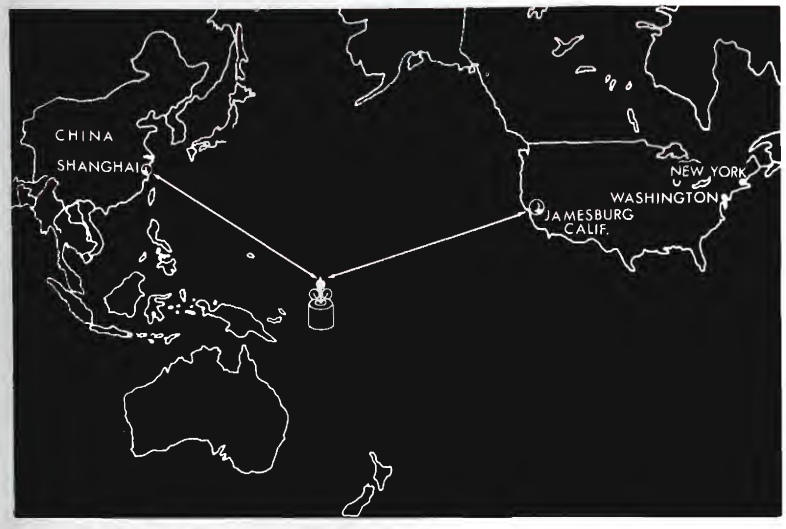
RCA on the Isle of Man

The Isle of Man, famous as the home of the TT-Races and the famous tailless Manx Cat, is in the Irish Sea, just west of the Lake District in England. Residents of this historic place are called "Manxmen" and they will soon be able to enjoy a completely new sound in their radio programs. They will receive better music, news, and conversation programs, because Manx Radio, the only station on the island, has moved into new quarters and its refurbished studios have been equipped with RCA high-fidelity radio station equipment.

Manx Radio has had several "homes" since it first went on the air some eight years ago. Initially, it broadcast from a small moving van parked at Signpost Corner. Then, in May 1965, operations were transferred to the basement of the Masonic buildings, located in the center of Douglas, the capital city. But now, the station occupies the new building pictured here, a modern structure overlooking Douglas Harbor and Bay.

The "all-RCA" installation for Manx Radio includes a specially-designed BTA-10L Transmitter and antenna tuning unit. This 10 Kw unit was supplied with a 3-level power cutback kit permitting operation at 10, 5 and 1 Kw. Radio programming is created and presented from a fully-appointed sound studio, using a "BC-series" audio consolette, plus turntable, reel-to-reel and cartridge tape machines. RCA Limited, Sunbury, assisted with the installation. The station operates on two frequencies—regular broadcasts on 1295 KHz and a supplementary religious service on 1594 KHz. Two FM transmitters relay these signals from Snaefell, the highest point on the island.

The Manx Government acquired the station in April 1968, from a holding Company that had opted on divestiture, since it had not been profitable. The Bill authorizing purchase of the station had to be passed through the Isle of Man's Parliament, known as the "House of Keys". This body wanted the station to be a financial success, so they sought out RCA for station planning assistance and supply of modern equipment. They are pleased by test results and expect their investment to produce substantial dividends, as increased advertising revenue is anticipated due to the new equipment and the impending introduction of commercial radio in the United Kingdom. Manx Radio is the first licensed commercial radio station in the British Isles.



A transportable communications satellite earth station was installed near Shanghai by RCA Global Communications, Inc. in cooperation with the Chinese Telecommunications Administration. The CTA provided live TV transmission and other international communications services during President Nixon's visit.

Communications Station in China Provides Live TV Coverage of President Nixon's Trip

An RCA Global Communications transportable communications satellite earth station near Shanghai, China, enabled the Chinese Telecommunications Administration to provide live TV transmission and other international communications services during President Nixon's visit.

The station was installed under a $2.9 million contract with the China National Machinery Import and Export Corporation. The agreement also called for RCA Globcom to supply 20 units of its newly developed Videovoice system as well as microwave terminals to relay TV, telephone and telegraph between Shanghai and the earth station.

The new Shanghai earth station will dramatically enhance China's international communications capabilities and open up the potentials of the satellite technology for the continuing direct exchange of information by video, voice and record between China and the U.S. and other countries for the future.

Technical discussions were conducted with representatives of the General Administration of Telecommunications of the People's Republic of China, and the Peking and Shanghai Bureaus of Long Distance Telecommunications. The contract was signed by the China National Machinery Import and Export Corporation, the procurement agency for telecommunications.

The earth station and other facilities was installed by 23 engineers and technicians provided by RCA Globcom together with technical personnel from the Chinese Telecommunications Bureaus. The RCA Globcom technicians assisted with maintenance and operation of the station.

Four special cargo flights by super Hercules aircraft flew the equipment and personnel to Shanghai. The components of the station were obtained from a variety of locations in North America and Guam. The equipment was assembled, transported and integrated for operation in less than a month.

At the same time, The Chinese Telecommunications Bureau constructed the site including the powerhouse, administration building and microwave tower.

The station consists of two transportable vans which contain all the transmitting and receiving communications equipment, a 33-foot parabolic antenna, a power generation system and various test equipment. Initially, the station has the capability of television transmission, 23 two-way voice bandwidth circuits and 12 two-way teleprinter channels. The station will be expanded to 60 voice grade circuits and it is expected that the facility will continue to be utilized for international communications.

Two of the Videovoice units were available in time for use in conjunction with the President's trip, and the remaining 18 units are scheduled for delivery by June. Videovoice enables two individuals engaged in international communications to see one another as they talk, or to exchange pictures, diagrams and other visual material.

RCA Globcom has requested the necessary U. S. Government authorizations for the transaction and the operation of satellite communications circuits to handle TV, leased channels, telegram and facsimile traffic for U. S. newsmen covering the President's visit. RCA Globcom will utilize the existing Jamesburg, California, earth station to communicate with Shanghai.

The International Communications Consortium also has been requested to approve access to the Intelsat IV space segment.

RCA Globcom presently is the only international carrier operating direct telegram and facsimile communications with China. The direct service was restored in September 1971, after an interruption of three years.

TV Tapatia Has First "F-Line" Transmitter Delivered to Mexico

Television Tapatia, S. A. de C. V., Mexico has purchased a complete television transmitting station from RCA, including the first "F-line" VHF transmitter delivered to Mexico. The contract, in excess of $160,000 covers a TT-15 F1, 15 kW Television Transmitter and a TF-5CM Superturnstile Antenna, plus necessary accessories. TV Tapatia has been in operation for nearly 10 years, with the aid of an RCA TT-2BL, 2 kW transmitter. The new TT-15 FL will enable them to send a better quality picture to a greater number of residents of the State of Jalisco. The station began telecasts with their new equipment last October. Its recently acquired transmitter/antenna configuration provides an effective radiated power (ERP) of 75 kW on Channel 6, to the city of Guadalajara and its environs.

RCA Helps ORF Build a "Dream City"

By John P. Taylor,
Marketing Consultant*

The largest construction project in Austria today — and probably the largest television complex presently under construction anywhere in the world — is ORF ZENTRUM WIEN (Vienna Center). When completed in 1974, it will house all of the TV operations — not only production and technical, but also management and administrative — of the Austrian Broadcasting Corporation (Osterreichischer Rundfunk) — ORF for short. It will be one of the world's great television centers — and for the people at ORF a dream come true.

Zentrum Wien is big anyway you look at it. It occupies a ground area the equivalent of seven blocks long by three blocks wide. It will have nearly 900,000 square feet of working space — half in technical and production areas, the remainder in office and supporting service areas. Some two thousand people will work there — and they will find within the complex every convenience they could wish for, including restaurants, parking, gas stations, a post office, and a bank. The present estimate of the cost of the project is 1.4 billion Austrian schillings (about $60 million).

Size, however, is not the only thing that makes this new Television City so interesting. There are other TV complexes as big — some, perhaps, bigger. But there are none built just the way this one is being built. And there are none, to our knowledge, that were planned in such an interesting and unusual way.

Consider, for example, these interesting facets of the project:

(1) Zentrum Wien will originate all of the TV programs for a whole nation.

(2) It is intended to meet all of the nation's programming needs for the next decade.

(3) It is being built "all at once" — rather than in piece-meal fashion.

(4) Planning for it is based on a known trend of income and a relatively fixed program mix.

(5) By ORF management decision it will use American experience in color TV production techniques—adapted for Austrian requirements.

(6) Complete systems design and management, as well as equipment planning, specifications, installation supervision, and testing is being done by RCA (as Project Manager) — working closely with the ORF Technical and Operations Staff.

(7) The newest concepts in centralized equipment placement and assignment switching are being utilized to the fullest extent.

(8) The two program continuity control centers (which feed the two Austrian nationwide TV channels) will be fully automated.

*Previous to his retirement last year, Mr. Taylor was Division Vice President, Commercial Systems Planning, for the RCA Communications Systems Division. He is now a Marketing Consultant specializing in broadcast and cable television planning.

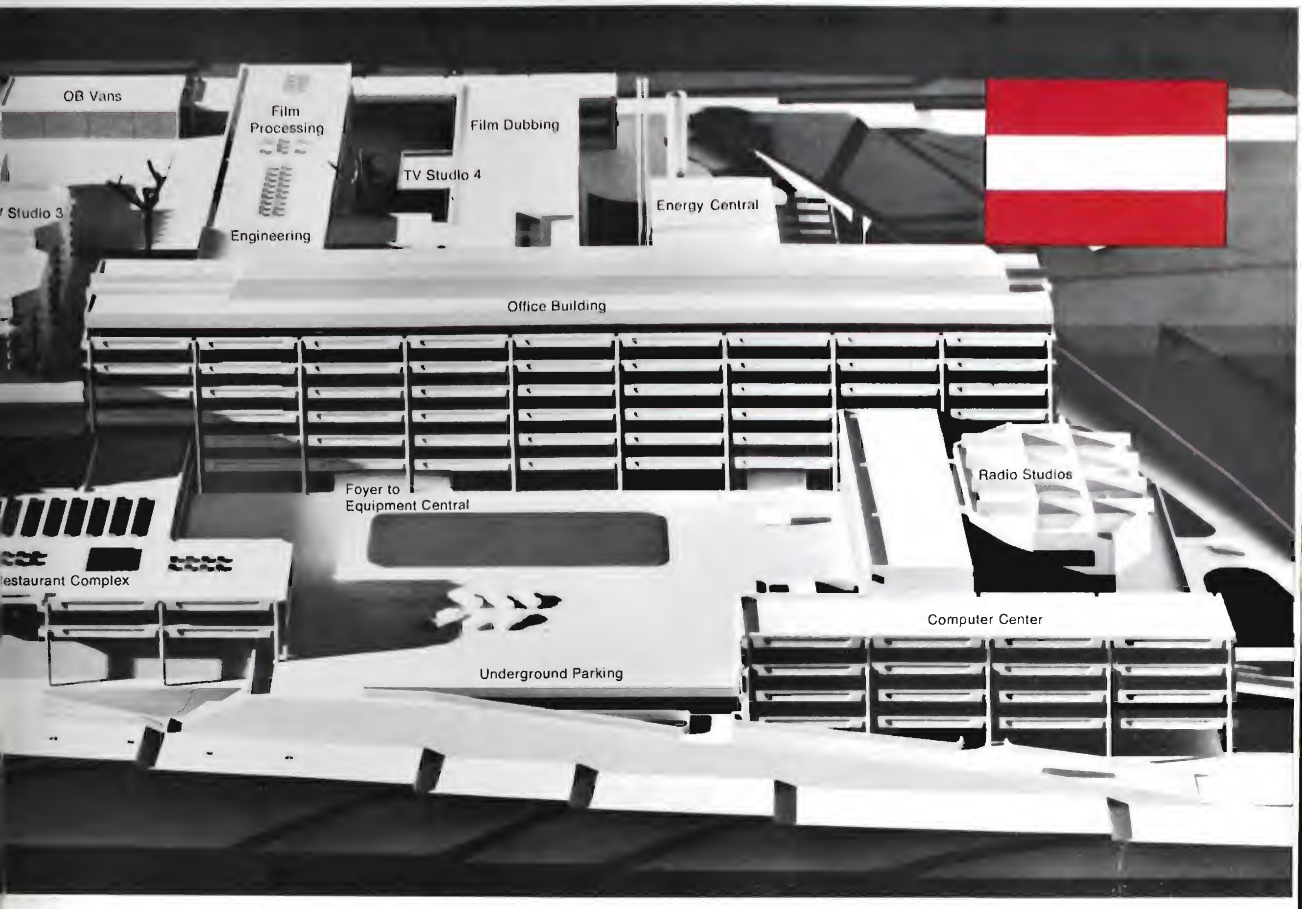


Fig. 1 This is a model of the elaborate studio and administrative complex which the Austrian Broadcasting Corporation (ORF) is building on the Küniglberg ridge in the southwestern environs of Vienna.

(9) Special facilities will be provided to implement ORF's unique position as the officially-designated interface between the Eurovision and intervision networks.

These are just some of the interesting features of this unusual project. There are others — for example, the specially designed TV Theatre which is intended to capitalize on the fact that Zentrum Wien is located in one of the world's greatest musical and theatrical centers; the sharply modern and functional construction of the buildings in the center; the interesting concept of "energy canals", etc.

At the moment the buildings at Zentrum Wien are just rising from the ground — and it will be some months yet before the first production is aired. But the background of the project, how it came into being, the procedures involved in its planning, and a preview of what it will be like when finished seemed of such interest as to justify this preliminary article.

To fully appreciate the Zentrum Wien story — and to understand the thinking behind it — one must know something of the background. It begins with the story of ORF — its raison d'etre, its organization, its objectives.

ORF—"a government-owned, yet independent company"

In 1964, the Austrians in a nationwide referendum expressed their displeasure with a state broadcasting company based on political proportionality as it had developed in Austria after the withdrawal of the allied forces. As a result, a new Austrian broadcasting constitution was written in 1964. However, it did not go into effect until 1966 when the Austrian Parliament, heeding the public wish, passed the law which created ORF — a company that was to be government-owned, but independent (of government) in its policies and operation.

To insure this independence, the law established an Aufsichtrat (Supervisory Council) to be made up of outstanding citizens of the Republic. The Council consists of 22 appointed members. Six of its members represent the political parties which have seats in the House of Parliament. Nine members represent the provinces; one being delegated for each province. Five members represent the sciences, the arts, the social education, religious institutions and sports. Two members represent employees. This supervisory council is responsible for the selection and the appointment of a General Intendant (or President). The General Intendant in turn is responsible for the appointment of four directors, (or executive vice presidents), a director for television programming, a director for radio programming, a technical director, and a commercial (or business) director. He also appoints nine intendants who are responsible for the operation in the nine provinces. These appointments are subject to the approval of the supervisory council.

GERD BACHER
General Intendant, ORF

HELMUT LENHARDT
Commercial Director, ORF

NORBERT WASSICZEK
Technical Director, ORF

Planning All the Television For the Whole Nation

The General Intendant and the directors are responsible for the long range planning, the financing, all the technical aspects of programming, and the cost and time allowances for commercial and all related contracts. They are also responsible for working out schedules and selecting programs for the radio and television networks.

Anyone who has had the responsibility — and the headaches — of putting together a "balanced" schedule for even a single station or network will surely shudder at the thought of having to provide *all* of the radio and television for a whole nation. Add the complications that (a) it's a nation of highly developed artistic tastes, and (b) it's one with a populace of varied cultural backgrounds, and you have a picture of the challenge that ORF management faces.

In radio it's no great problem. Three programs do it nicely. Briefly described, the three radio programs are:

"Osterreich 1", a "sophisticated" program with emphasis on *good* music, literature, science, and information.

"Osterreich 2", featuring local programs of the nine states — including folklore and local entertainment of the region.

"Osterreich 3", a *modern* entertainment program (pop, jazz, dance-music) with news on the hour.

Osterreich 1 and 3 are mainly produced in Vienna and transmitted to the whole nation by some 500 radio transmitting stations (many of them operating as "translators"). Advantage is taken of Vienna's world famous operatic, symphonic, orchestral, and dramatic groups to provide a rich cultural smorgasbord. The "Osterreich Regional" programs are originated in the nine regional centers and are tailored to the interests of the regional areas.

In television the problem is more difficult — especially since the advent of color.

At the present time ORF is providing two television programs — designated TV 1 and TV 2. To quote ORF "both programs broadcast daily a so-called integrated alternative program". By this it is meant that the two programs complement each other as to their themes. Their program schedules are adjusted so that they do not compete with each other. There may even be a direct tie-in between programs on the two channels. For example, TV 2 may first air a documentary which is afterwards complemented on TV 1 by a TV-film or TV-play dealing with the same theme. The viewers' attention is drawn to the possibility of changing channels. It's one of the things that can be done when both programs are originated by the same broadcasting entity (and there is no competitive pressure to get the lion's share of the audience).

Starting the first of this year both TV 1 and TV 2 are fully colorized. The only difference between the two is that TV 1 carries advertising (up to 20 minutes a day) whereas TV 2 is kept free of advertising. Also TV 2 has most of its early evening hours reserved for educational television.

All of the origination for the two TV services is done in Vienna and broadcast nationally from that point. There are no regional originations. However, regional representation is provided by film crews in each regional center who send film to Vienna for incorporation in news and special event segments on the national network.

Supplying all of the programs for two national services is an enormous task — particularly in light of the requirements for a high degree of artistry and the need for satisfying a wide diversity of interests. ORF program people have displayed both talent and ingenuity in doing it. They have taken full advantage of Vienna's many artistic attractions — the opera, the Philharmonic, the stage, and musical groups. They use considerable material from Eurovision, from Intervision (the Eastern European network) — and from neighboring countries. They have gone in heavily for "co-financing".

ORF Management Organisation

General Manager Gerd Bacher

Commercial Director Helmut Lenhardt

Technical Director, Dipl. Ing. Norbert Wassiczek

TV Program Director, Dr. Helmut Zilk

Radio Program Director, Dr. Alfred Hartner

The men who are building Zentrum Wien

Management Committee

Dir. Helmut Lenhardt, Mgr., Chairman

Dir. Dipl. Ing. Norbert Wassiczek

Dr. Paul Twaroch

Prof. Dr. Roland Rainer

Robert J. Venner

Dipl. Ing. Arch. Heinz Haschek

ORF Zentrum Wien Committee

Dipl. Ing. Norbert Wassiczek, Mgr., Chairman

Dipl. Ing. Reinhold Kayser

Dipl. Ing. Arch. Heinz Haschek

Ing. Hans Kikinger

Ing. Felix Gampe

Dr. Franz Brunner

Ing. Herbert Bialas

Dipl. Ing. Erich Schenk

Prof. Dr. Roland Rainer

Arch. Attila Bese

Robert J. Venner

Ing. Edauard Gschiermeister

Ing. Ferdinard Schober

Dipl. Ing. Karl Sinabel

Fig. 2 Aerial view of construction progress on "Zentrum Wien", the television city which the Austrian Broadcasting Corporation (ORF) is building on the Küniglberg ridge in southwest Vienna. Schönbrunn Palace, mecca of millions of tourists, is in the center background.

This is an arrangement in which two or more countries join in financing the production of programs which both use. They use many films and tapes from other countries — and they have an elaborate setup for redubbing of sound track. And, as noted above, they have film crews in their regional centers to furnish not only news clips but also special programs of high regional interest. They depend very heavily on their OB vans not only for special events but for many regular programs.

Need for new facilities

Unfortunately, the physical facilities which ORF inherited from the earlier broadcast era were not up to either their needs or the talents of their people. From the end of the Allied Occupation till 1967, broadcasting in Austria had grown in a haphazard and ill-supported manner. Money to build adequate facilities had not been forthcoming and long-range planning was nonexistent.

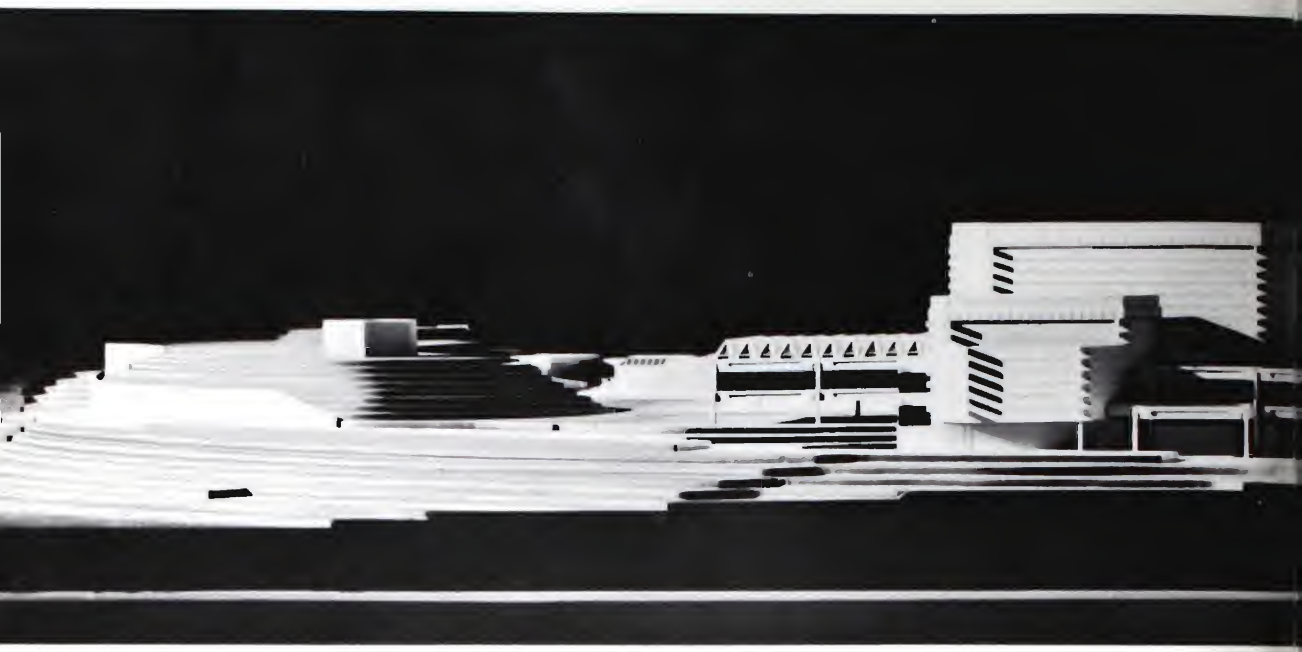
Thus when the newly formed ORF management took over in 1967, they found that all television production areas were in dire need of overhauling. Strewn all over the federal capital, they had never been intended as anything but temporary quarters. They had been in use for many years, some of them for over a decade. Housed in barracks, former stables, an old playhouse and a former cabaret, television production could be maintained only by the daily stopgap actions of an ingenious operating personnel. Moreover, the operating areas not directly engaged in television production, such as the program services, the technical planning, and the business administration offices were also strewn all over Vienna. Efficient operation, which calls for close contact between the various departments, was out of the question.

These problems led the ORF management to a decision, taken in the summer of 1967, to consolidate in one location all producing and nonproducing departments of ORF (with the exception of radio, which was to remain in the old Vienna Radio Broadcast Building on Argentinierstrasse). But much thinking, studying, planning, and negotiating had to take place before the dream of 1967 could be transformed into the actuality of the "television city" which is now rising on the grounds of a former army barracks on the Küniglberg ridge near Schönbrunn Palace.

Planned for a decade of use

In the situation which ORF management faced in 1967, the obvious first step was to prepare a comprehensive forward-looking plan for both construction and operation. ORF chose a time span of 10 years for their planning. The investment plan had to include not only the TV center but also the construction and installation of four new radio stations in the provinces and the extension and improvement of program distribution by the addition of transmitting systems throughout the whole country.

The program eventually arrived at envisioned a construction program adding up to about 200 million dollars. Of this total more than half was for transmitter construction, and about 40 per cent for the new production studios. Zentrum Wien in itself represents about 60 million dollars.



The American Challenge — RCA Becomes Project Manager

ORF's building program — even when visualized as a ten-year investment — represents a rate of building some five or six times greater than the annual rate in the years preceding 1967. It was obvious that the ORF technical and operations staff was not large enough to handle the whole program. Moreover, it was the desire of ORF management to take as much advantage as possible of the experience in color TV production which had been gained in some other countries. For these reasons a decision was made that the ORF staff would plan and supervise the transmitter expansion and that an outside contractor would be employed to plan and supervise the Zentrum Wien project.

After preliminary negotiations it was decided to further split the studio project into two parts: the building construction part and the equipment part (the latter including not only electronic but also power, intercom, etc.). For the construction, ORF chose as architect Prof. Dr. Roland Rainer, an Austrian who is known throughout Europe for the modern and functional "stadthalle" he has designed.

The choice of equipment contractor was more time consuming. There is no qualified Austrian firm specializing in video electronics — so a "tender" (request for bid) was sent to electronic firms in other countries. Four firms — from as many different countries — entered bids. These bids varied not only in equipment specified but even to some degree in philosophy of operation. ORF had to evaluate carefully the pros and cons of each in the light of its requirements.

The American challenge

After careful consideration ORF chose RCA as the equipment contractor. They give two basic reasons for their choice. One is that only RCA offered a "centralized" system employing the concept of "assignment switching" which allows major equipment sources (cameras, tape recorders, film islands, etc.) to be assigned to program centers as needed. ORF's evaluation showed this would improve equipment and personnel utilization and make both installation and operation more "cost effective".

The second, and most intriguing reason, was the belief of ORF management that the United States, having led in color television introduction, and having produced far more color programs than any other country, was surely the repository of the most experience in color production. They wanted the benefit of that experience. And the best way to get it, they felt, was to bring American methods and management into their planning. Whether or not they had read Servan-Schreiber, they certainly recognized the American challenge — and they decided on a course which would turn it to their advantage.

The agreement between ORF and RCA calls for the latter, through its subsidiary, RCA, Ltd., to act as project administrator on behalf of ORF for the engineering portion (including audio, video, intercom, telephone, power) of the Zentrum Wien project. Basically, this means that RCA is responsible for all elements of planning (in general and in detail) for equipment specification and recommendation, for equipment-installation management, for systems test, and for training ORF personnel in operation. In some areas RCA is assisted by subcontractors. For example, in detailed audio-engineering planning by the Austrian Seimen Werke AG and in detailed high-voltage engineering by Elin-Union AG — both of them Austrian companies.

Role of the Schrack company

Special note must be made here of the part which the Schrack Company of Vienna plays in the Zentrum Wien project. This is a well-known Austrian company which was founded in 1919 by Dr. Eduard Schrack, a noted pioneer and inventor of the early wireless days. Through the trials and tribulations of wars and foreign occupancies it has grown until today it boasts four plants — making it one of Austria's largest manufacturing companies.

Since 1955 a division of the Schrack Company, headed by Dr. W. J. Zandra, has represented RCA in Austria. They played an important part in the discussions and negotiations which led to the RCA contract with ORF. In addition, the Schrack Company is a very important sub-contractor in that it has the responsibility for installing the video equipment — a critical task. As the Schrack people are familiar with the local conditions as well as with RCA technology and engi-

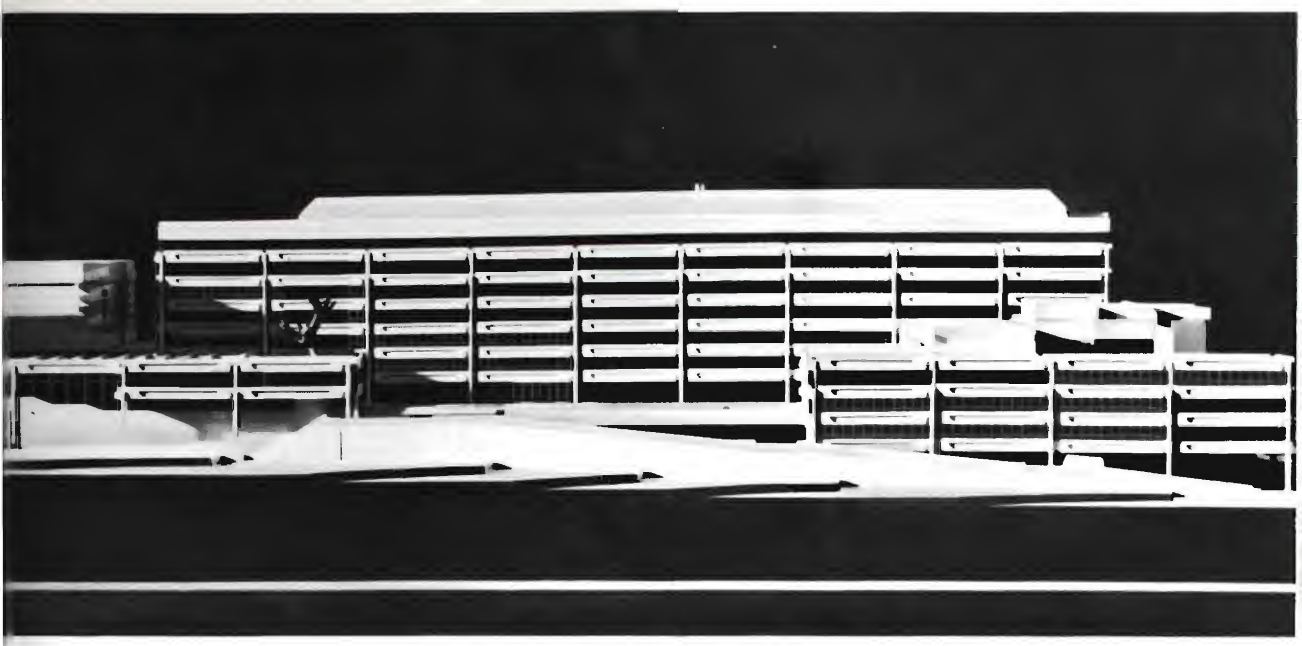


Fig. 3 This view of the model shows how the Zentrum Wien complex will look from the side which faces downtown Vienna. The site is on the top of a long ridge and the building complex is low-slung and sprawling—which is consistent with the function as well as the topography.

neering, this is a very favorable arrangement.

Planning starts—with income

Most building plans start (or should start) with an estimate of production load — both present and future. For stations (or networks) that are based entirely on advertising support, and that operate in a competitive environment, the prediction of future production load is fraught with problems. Horrendous assumptions have to be made as to income, program mix, and costs.

In this element of planning ORF had an advantage. They knew with reasonable certainty what their income would be — at least for the near future. ORF's revenues come two-thirds from subscribers' fees and one-third from the sale of a limited amount of advertising. Some 2.0 million radio subscribers pay AS 20 (about 80 cents) a month. About 1.5 million TV subscribers pay AS 50 (about $2.00) a month. These fees are fixed by the Supervisory Council. There are approximately 2.4 million households in Austria. A considerable number of these are in remote mountain areas, hard to reach even by radio signal. Thus the number of radio subscribers will probably not increase very much. TV subscribers, theoretically, could increase up to some number approaching the radio number.

The amount of TV advertising time which can be sold is limited to twenty minutes a day on the first TV program. ORF management believes they could sell much more but this time limitation is set by law.

Thus ORF has a relatively foreseeable income, and this has eliminated one of the variables in planning. Of course, it has some disadvantage in that it limits the amount that can be budgeted for programming. However, ORF's production costs are lower than U.S. costs—and they have a number of ways by which they can stretch their program dollars.

The advantages of "co-financing"

The total program production budget of ORF is, by U.S. network standards, modest. But they make it go a long way by making full use of several external program sources. First, they make extensive use of recorded programs (tape and film) available from other countries. Ordinarily, payment for such recorded programs is on a basis of homes reached. Because the Austrian audience is (by big-country standards) rather small, the cost to ORF is relatively small. Second, they make full use of Eurovision programs — both news and specials. These, too, are paid for on the relatively low-cost, homes-reached basis. Third, they engage, wherever feasible, in "co-financing" of programs. In "co-financing" two or more countries agree beforehand to share the costs of producing a series of programs which both will use. The programs may be produced in either or both countries. In either case, the costs are split in the ratio of the audiences of the two countries. Here again ORF gets a bargain because its audience is usually much smaller than that of the second country. For example, the number of Austrian TV licenses is only 1.5 million, whereas the German is nearly 17 million. The population of Austria is 7 million and of Germany is 60 million.

Through the wise use of these external program sources ORF is able to extend its program hours without having to skimp on the quality of its own studio production.

Translating income into programs

ORF knew what its income would be. But how many of what kind of programs would that income allow? At the start ORF did not know what various types of programming cost, or how much studio time was required for each. This was because previous to 1968 no detailed cost breakdowns had been kept. And, in any event, most experience till then was in monochrome.
In approaching the problem ORF used the services of a production specialist from NBC. Starting with NBC experience in cost of producing programs of various types (and studio time required), he worked with ORF people to adapt these figures for Austrian costs and productivity rates. The tentative standards thus arrived at were compared during 1968 and 1969 with actual ORF costs at its existing Rosenkugel studios. The correlation was found to be good. These figures, then, were used by ORF in determining how much of each type of programming their budget would allow.

With their program plans thus made, they were able to tell RCA engineers how many hours of live studio time, film time, tape time, etc. had to be provided for. To provide for contingencies and possible growth they added a 25 per cent factor. From this information RCA engineers determined the amount and type of studio space needed, the operating requirements, and the equipment to go with these requirements.

How many studios—how big?

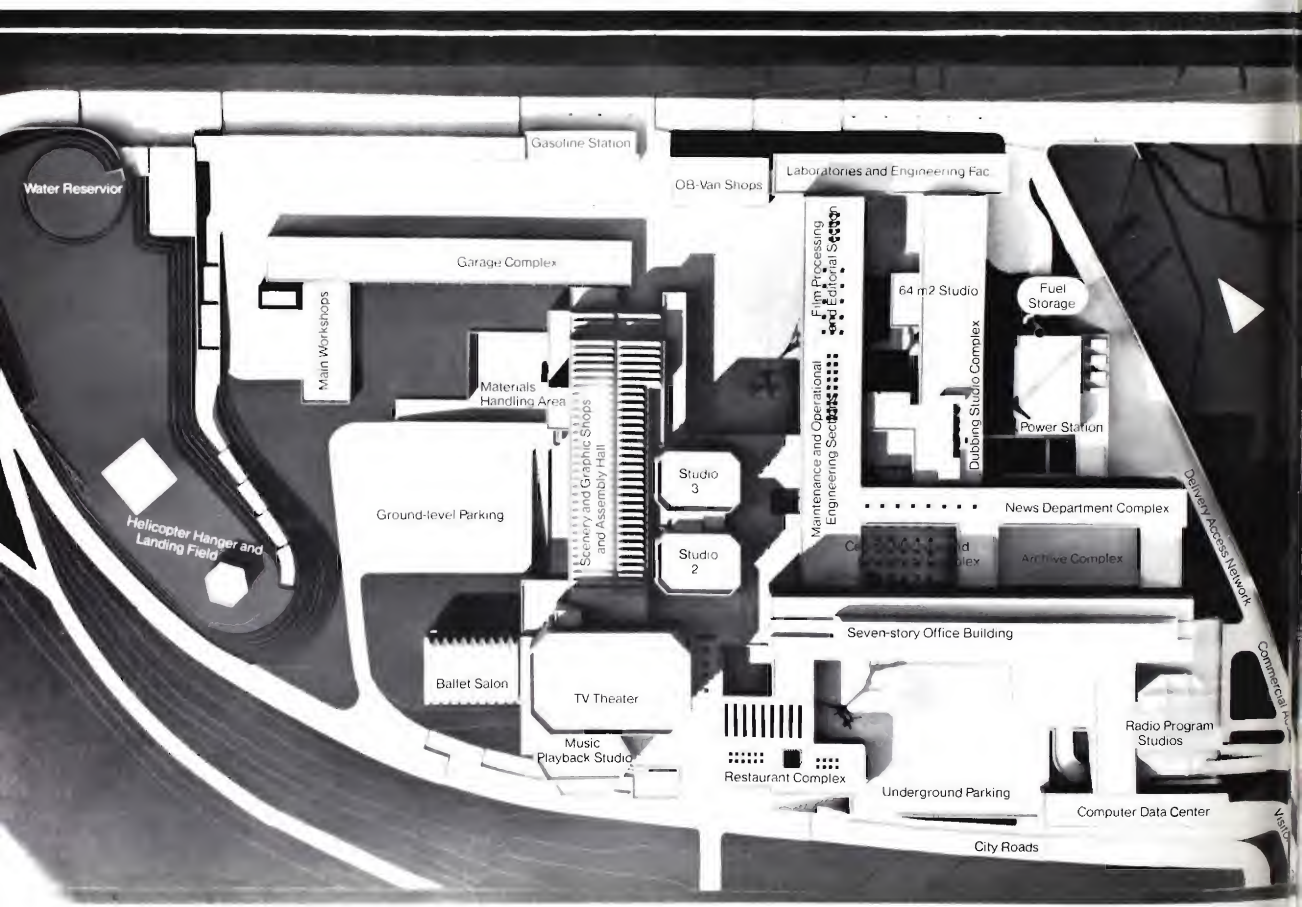
In the next step, RCA engineers — working from the ORF projection of studio, film, tape hours — developed a preliminary studio plan. In doing this they were assisted by the NBC production people and, of course, they also worked closely with the ORF operations people. The basis of planning was to provide studio facilities which would make it possible to conveniently produce the required number of high-quality program hours at the lowest overall operating cost. The plan arrived at called for two 470 m² (5000 sq. ft.) production-type studios, a 64 m² (700 sq. ft.) news and interview studio, and a 970 m² (10,300 sq. ft.) Theatre Studio. An exception to the cost-effectiveness principle was made in the case of the Theatre Studio since this was to be an installation whose cost justification went beyond the ordinary needs of program production.

In addition it was necessary, of course, to determine the space required for studio control rooms, master control, equipment room, and machine (tape and film) room. These were calculated by working back from the studio production requirements. From these the number of cameras, film and tape machines, inputs, outputs, switching, etc. needed by each location were determined; tentative equipment layouts made; and necessary space requirements listed. The sizes of these technical areas, together with the desirable physical relationship between them, were given to the architect for incorporation in his grand design.

The Administrative areas

Since the ORF Center is to contain not only production facilities for television, but also the offices of the general management and of three departmental managements and their staffs, extensive studies were required to determine the additional space requirements — the size and number of offices, meetings rooms and storerooms, the extent of the parking areas, the size of the cafeteria and of the restaurant, and the number of snack bars, lounges, etc. This planning was carried out by ORF at the same time that RCA engineers were planning the technical areas. The two inputs — technical and administrative — formed the starting point for the architect's design of the overall complex.

Fig. 4 Looking down on the model of Zentrum Wien. The buildings, which are identified here, are further described in following pages.



Architectural Design — Emphasis On Functionality

Dr. Rainer, the architect responsible for planning Zentrum Wien, is a strong functionalist. Thus a basic tenet of his design approach is that the function of a building, or complex of buildings, should determine their form— and that the design should proceed from the inside out. In the case of Zentrum Wien he has said that he began by visualizing it as a factory complex for producing programs. Thus his first step was to analyze the requirements for technical, production, and administrative operations — not just the space required for each, but also the relative locations of the several areas for best working relationships — and for easy flow of traffic between areas. From this he produced a tentative interior plan, which became the subject of lengthy discussions between the architect, the engineering contractor, and ORF management. It involved considerable give and take. But eventually he had a layout plan with which all were satisfied.

Dr. Rainer's second step, then was to position the various building areas of the complex with relation to the land plot. As will be noted on the ground plan (Fig. 6) the plot is bounded on the north side by Elisabeth-Allee and on the south side by Wurzburggasse. The former is a wide street with easy access to the Western and Southern Throughways. For this reason, the entry to the workshops, scenery assembly area, and garages for mobile units and other heavy equipment were placed on that side. Access for passenger cars of employes and visitors was planned for the Wurzburggasse on the opposite side of the plot — thus keeping the two types of traffic completely separated.

Only after this preliminary planning was accomplished did Dr. Rainer turn to the design of the buildings themselves. In doing so he also took into special account the nature of the site — which is on a long hill that extends from the Vienna woods to Schönbrunn Palace. He realized that the completed buildings would be visible from many points in the city and he felt that the complex should have a long, low silhouette in keeping with its long, ridge-like location. Thus the buildings he designed are low-slung and sprawling, and this is consistent with their function as well as the landscape.

A complex of buildings

Zentrum Wien is a complex of special-purpose buildings which are essentially of independent construction but are all joined together at the ground and first-floor levels — so that internal traffic flows easily between them. The main buildings are identified in Fig. 4 which is a model of the complex as it will appear when completed in 1974.

In the approximate center of the plot is the "studio complex". This consists of the TV Theatre Studio, with its appendages, the Playback Studio, the two production studios (TV Studios 2 and 3) and the Scenery Stages (Montagehalle). The latter is in the form of a "prop lane", the front end of which opens into the TV Theatre, while Studios 2 and 3 open off of it on the right. At the left (in the area marked Materials Handling) there is space to build two or three additional studios which also would abut on this "prop lane". This placing of the studios around a center prop area was a basic part of the layout planning.

The studios and the lobby are on the first floor of the building. This is the Austrian designation—in the U.S. parlance it would be the second floor. On the ground floor, immediately underneath the studios, are dressing rooms, lounges, a rehearsal room, etc. — and areas for a power sub-central and air-conditioning units.

Also on the ground floor, just to the right of Studios 2 and 3 (and behind the end of the office building), is a one-story building housing the technical complex. This includes the central equipment room, the machine room, master control, and the various production and continuity control rooms. These are described in detail later.

To the right of the studio complex is the seven-story, 135-meter-long office building which will house all of the ORF's management and administrative operations except those for radio (which will remain at the downtown radio studios). At the rear of the office building are two, three-story wings which are largely occupied by maintenance, laboratories, news and film operations. There is also a fourth TV studio in this area for originating interview-type programs. Also behind the office building, and farther to the right is the power plant — called Energy Central.

At the far right of the plot are buildings for the news radio studios and the data processing operation. At the far left is a 9-meter-high hill on which will be located a water reservoir, a helicopter landing plot, and a helicopter hangar.

In the center front of the complex is a large plaza, beneath which there is a four-level parking garage accommodating 1,000 cars. At the left of the plaza is the restaurant complex. A more detailed description of these various areas is given later.

Fig. 5 (right) Architect for Zentrum Wien is Prof. Dr. Roland Rainer, shown with a group of his associates. Dr. Rainer is well known for the Stadthalles (town halls) and other outstanding buildings he has designed for many cities in Austria and Germany.

- Production areas
- Offices (Programs, Technical, Administrative)
- Scenery shops, work shops, garages
- Energy central
- Lounge, restaurant, etc.
- Technical complex
- Sub-central

1. Energy Central
2. Subcentral
3. Central machine and equipment complex
4. Control room
5. Studio
5.1 TV Theatre (Studio 1)
5.2 Studio 2
5.3 Studio 3
5.4 Studio 4
5.5 Announcer Studio
5.6 Radio Studio
6. Scenery Shop
7. Film Developing
8. Film Editing
9. News and Engineering
10. EDV storage
11. Workshops
12. Archives
13. Conference Rooms
14. Offices
15. Lounge
16. Restaurant
17. Kitchen
18. Foyer
19. Storage Areas
20. Garage Area
21. Parking Area
22. Dressing Rooms
23. Rehearsal Studio
24. OB Van shops
25. Helioport

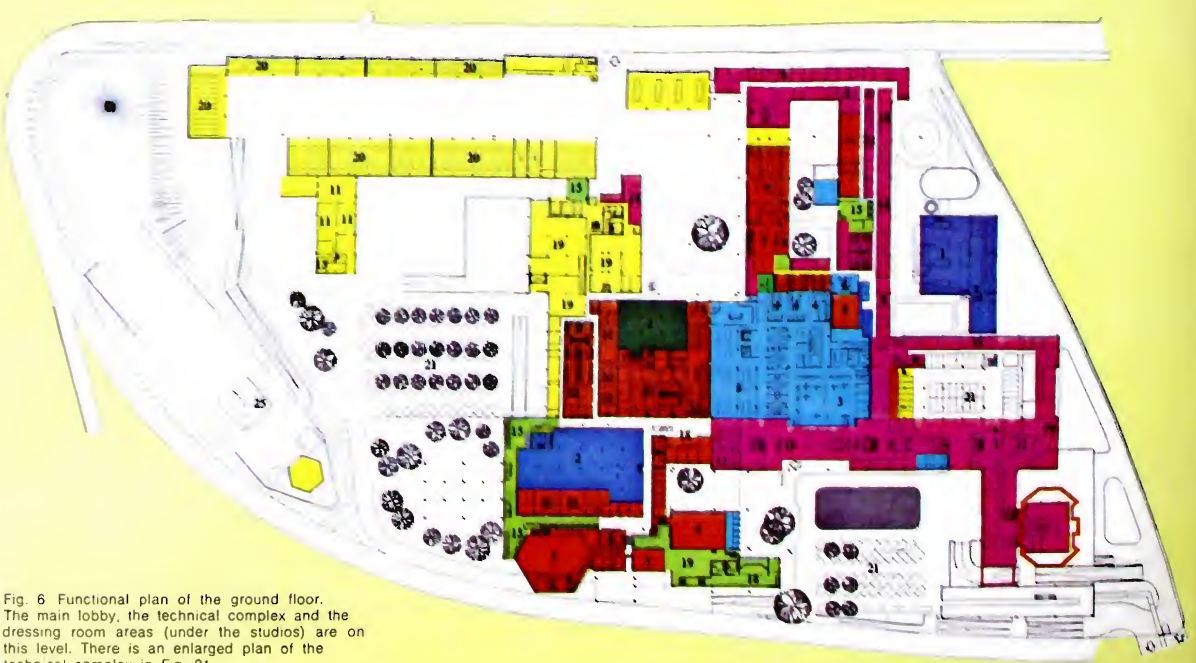


Fig. 6 Functional plan of the ground floor. The main lobby, the technical complex and the dressing room areas (under the studios) are on this level. There is an enlarged plan of the technical complex in Fig. 21.

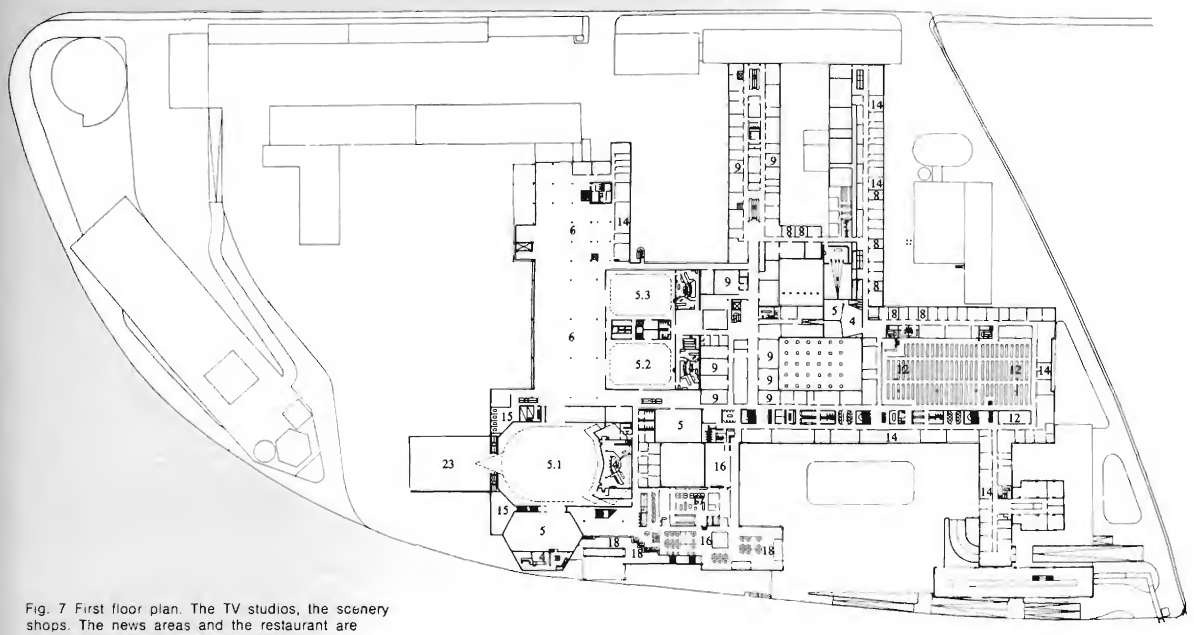


Fig. 7 First floor plan. The TV studios, the scenery shops. The news areas and the restaurant are on this level. There is an enlarged plan of the studio area in Fig. 14.

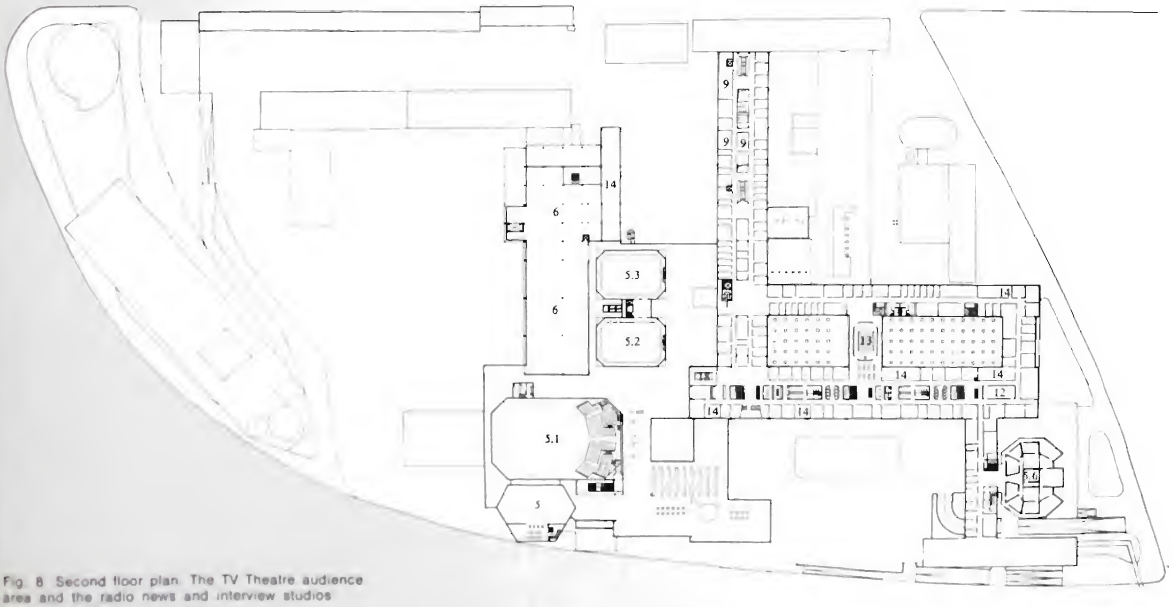


Fig. 8 Second floor plan. The TV Theatre audience area and the radio news and interview studios are on this level.

Construction Features Prefabricated Structural Elements

Construction design

The immense size of the Zentrum Wien complex (approximately a half million cubic meters), the stress placed on functional design, and the emphasis on "cost effectiveness" pointed to the extensive use of pre-fabricated structural members. Thus an early planning objective was to work out a design calling for as few different elements as possible — which could then be fabricated in quantity.

The answer which Dr. Rainer and his associates worked out for the office structures is a system of reinforced-concrete girders and standardized supporting pillars which latch together somewhat like a giant erector set. Although the appearence and design of these structural members seems very simple they are unusual — and probably unique — in a number of ways.

One of the features of the girders is their size. The height — as Dr. Rainer visualized it — should be such that a single wall girder would reach from the top of the window in one floor to the bottom of the window in the floor above. This dispenses with individual window sills and other minor detail. The proper height to do this turned out to be 1.5 m. (5 ft.) From the static viewpoint a good corresponding length was 15 m. (50 ft.) This is a much larger girder (Fig. 10) than ordinarily used in this kind of construction. However, after careful analysis it was determined to be an economical length—and it had the great advantage that the unusually wide spacing between interior pillars provided great flexibility in layout.

For the studios a similar construction design concept was used — although the shape and size of the members is different. The exterior studio walls are constructed solid from prefabricated reinforced-concrete beams stacked in "log cabin" building block fashion (Fig 12). The lengths are such that single beams have lengths equal to the studio ends and half the sides. The studio ceilings are made up of T-shaped members — the vertical section providing both rigidity and a convenient place for hanging the false ceilings.

All of the structures in the complex are formed largely of these prefabricated, statically effective elements which may be left exposed not only to the exterior but also in the interior where this does not conflict with the appropriate acoustical requirements of the rooms. Thus, despite the highly complicated technical installations, air conditioning throughout (including the offices), tinted window glass, thermal-barrier-type aluminum window frames, and fabric-covered walls in offices, public rooms, and the television theatre—the cost of construction of this building complex will be quite modest, relatively speaking, and the times of completion will be short.

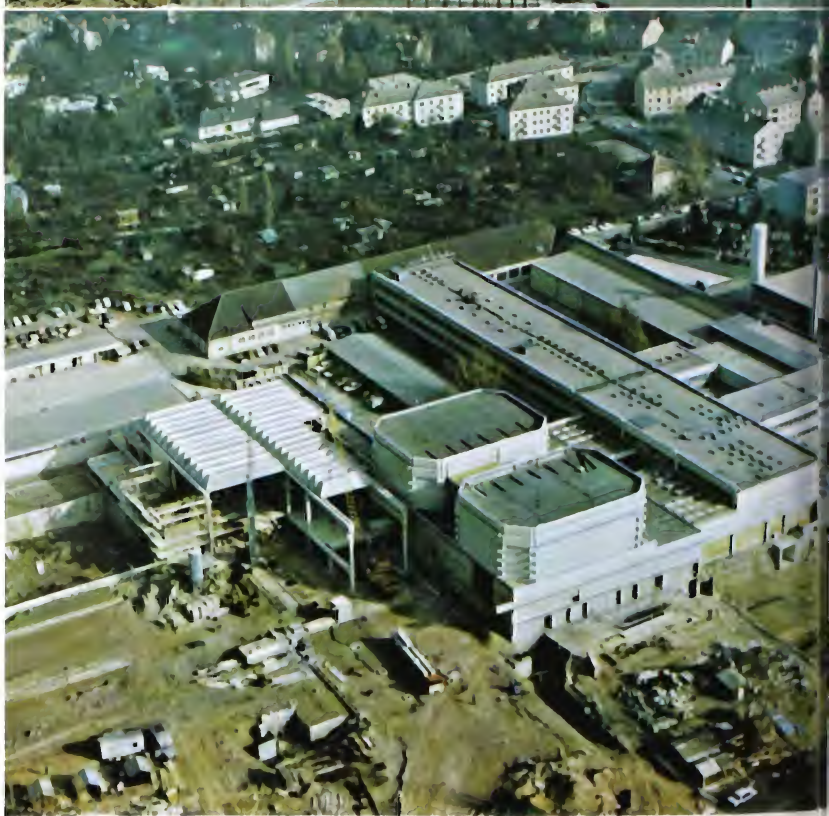
Fig. 9 To simplify construction most of the buildings in the Zentrum Wien complex utilized a system of reinforced-concrete girders and standardized supporting pillars which latch together somewhat like a giant erector set.

Fig. 10 The reinforced-concrete girders used in the Zentrum Wien buildings are unusually large—being 15 meters (50 ft.) long by 1.5 meters (5 ft.) high. This size was determined from functional and static considerations.

Fig. 11 The height of the girders is such that when assembled a single girder forms the wall from the top of one window to the bottom of the window above—thus eliminating individual window sills and other minor details. The length of the girders provides unusually wide spacing between interior pillars.

Fig. 12 Studios 2 and 3 during construction. The upper parts of the studio walls are reinforced-concrete sections assembled in log-cabin fashion. At the studio floor level (first floor) the two studios and the associated control rooms are joined in a single block. The large doors visible in this view open into the scenery shops which will occupy the area in the foreground.

Fig. 13 Aerial view of construction progress. At this stage the scenery shops (lower, left) were partially completed. When finished they will extend out to abut the side of the TV theatre which will be in the area at the bottom center of this picture.



Large-Sized Production Studios Provide Maximum Flexibility

The production studios

The production studios are where the design of the Zentrum Wien complex began. It has been previously pointed out how the ORF people, starting with their expected income, developed a program budget for some years ahead, allocated it to various types of programs and, with the help of an NBC consultant, translated this into required studio hours for each type of program.

Starting at this point the next step was to decide how to provide for the required hours — how many studios, what amount of area, where located, how equipped? Because this involved technical, production, and operational requirements it was worked out jointly among RCA engineers, the NBC consultant, and ORF operations people. The plan which evolved called for two main production studios, a small interview type studio, and a TV Theatre to be built in the first phase (to be completed by 1974). Ground area was to be kept available for possible additional studios to be built in a later period.

The two production studios are identical. Each has a floor area of 470 m² (5,000 sq. ft.)—and is 26 meters long and 18 meters wide. At the studio floor level (1st floor) these two studios are joined in a single block — with dressing rooms located beneath the studios. Also in this block (Fig. 14) are the two studio control rooms. Large doors open from the studios into the scenery shops.

The upper sections of the two studios are identical and are constructed of prefabricated concrete beams put together in log-cabin fashion (Fig. 12). In order to isolate the inner studio shell from the concrete outer shell a false ceiling is hung from the ceiling beams by acoustic insulation hangers (Fig. 17). Suspended two meters below this false ceiling is a grid structure for supporting the lighting system. In effect this is a slotted floor that lighting men can walk around on in order to move or elevate the lights which are suspended on telescopes.

From the floor plan (Fig. 7) it will be noted that the two studios are close to the central equipment complex, the office area of the news department, and the film-processing complex. From the dressing rooms or news department offices, respectively, the studio control rooms and the studios themselves are reached by a short, direct route. As a result of this layout, the two 470 m² studios are suited for use both as production studios and as news department studios. Each of the two studios is equipped with two permanently-installed color cameras. Additional color cameras can be "assigned" from the equipment pool, as noted later.

Production studio control rooms

The two studio control rooms are located immediately adjacent to the associated studios. There is a door from them into the studios—but they have no visual connection. The two control rooms are identical. Each is divided into three sub-areas surrounding a central monitor area. The producer, his staff, and the vision mixer sit at a control console in the center area. At their left is the audio control area, on their right the camera and lighting control area. Each of the three areas has its own set of monitors which are mounted in the wall of the central monitor room. At the back of the audio control area are tape recorders, record players, and a small auxiliary unit where one audio assistant can mix between tape recorders and record players. Telecine cameras, videotape recorders, the subtitler, or remote sources can be made available as required from the central equipment complex or from the master control room by means of the assignment switcher. The arrangement of the TV Theatre Control Room is similar except it is somewhat larger.

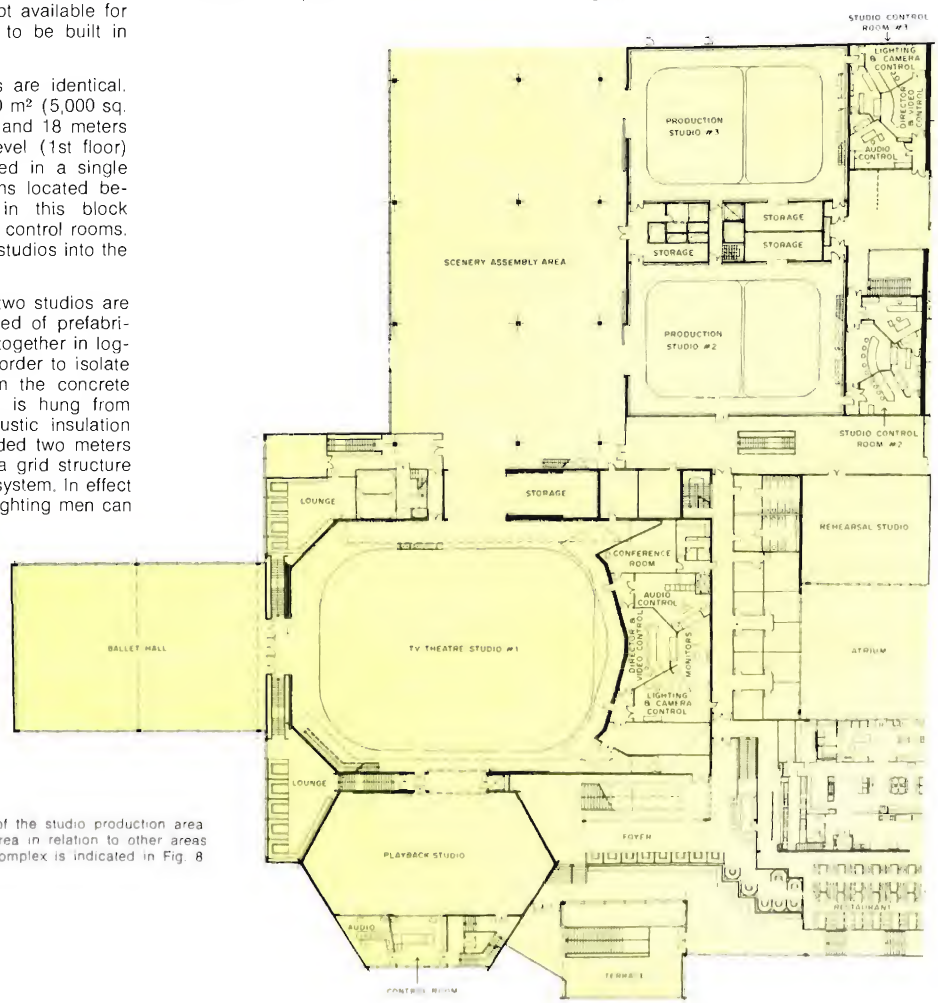


Fig. 14 Floor plan of the studio production area. Location of this area in relation to other areas of the complex is indicated in Fig. 8

A TV Theatre Of "Technically Perfect Appointments"

An outstanding theatre-studio

The TV Theatre, when completed in 1974, will be the most striking and unusual element of the Zentrum Wien complex. It differs from the rest of the complex in several respects. First, unlike the other production areas, it was not proposed initially by the NBC consultant or the RCA planning team — but rather was a concept of the ORF management. Second, it departs somewhat from the rule of cost effectiveness applied to the rest of the complex in that it is unlikely that a studio of this size, and so equipped, could be justified on a program-per-dollar basis. And third, it is provided with appendages and accouterments which would hardly be found in the strictly functional program factory visualized by Dr. Rainer.

Why did ORF opt for such a theatre? It goes back to the original concept of Zentrum Wien as "a workshop of intellectual and artistic Austria". It was the expressed desire of ORF management to provide Vienna — "the city of the performing arts" — with a TV Theatre of such technically perfect appointments that it would become well-known throughout Europe. It was hoped that such a theatre would be used not only by ORF for its more elaborate productions but that it would also be used by other broadcast organizations.

To assure that it met these objectives an extended study was made of similar theatre-studios in other countries — together with a study of the special requirements of the Vienna artistic community. The final design was based on a symposium of international theatre experts held in Vienna in 1969.

In exterior design, and in construction, the TV Theatre will be very similar to the production studios. Where it differs is in size, in the provision for audience seating, and in the various appended areas. The total floor area of the theatre is 970 m^2 (10,300 sq. ft.) of which 880 m^2 is production area. The dimensions of the production area are 34.5 meters by 25.5 meters. The height of the outer roof is 23 m — the suspension system for the lights is 14 m above the studio floor. The studio control room, which

Fig. 15 This elevated audience seating area at the rear of the TV theatre studio has fixed seating for 346 persons. The control room is located directly beneath (at studio floor level). Another 140 people can be accommodated on mobile chair units on the studio floor.

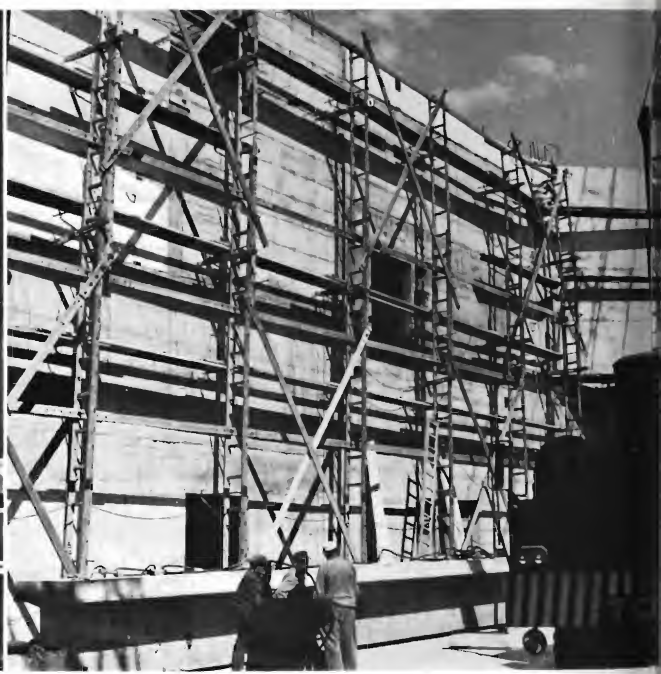


Fig. 16 View in Studio 3 during an early stage of construction. The size of these studios— 26 meters (85 ft.) long, by 18 meters (59 ft.) wide, is such that a number of sets can be accommodated simultaneously.

is at studio floor level, is a part of the studio building block (Fig. 14). Although immediately adjacent, and directly accessible, it has no visual connection. Directly above the studio control room is a balcony with fixed seats for 346 people. If desired, another 140 can be accommodated in mobile chair units on the production floor.

Playback studio and ballet hall

In the model (Fig. 1) and the floor layouts (Fig. 14) two auxiliary areas are shown appended to the theatre proper. These are the "Playback Studio" and the "Ballet Hall". The Playback Studio (which will be built as part of the initial construction program but will not be implemented until later) will be supplemental studio to the theatre studio. It will have large double doors that can be opened with direct visual connection to the audience studio. It can be used for an orchestra with direct connection; for rear projection into the audience studio; with the doors closed, as an isolated audience area; for rehearsals; or as a dubbing facility where a large number of people or an orchestra are involved. One of the problems in Austria, as in most of Europe, is the large quantity of material that must be dubbed to a different language. In order to facilitate this process, or to allow use of this area as a radio orchestral studio, an audio control room will be provided.

The original Zentrum Wien plans called for a "Ballet Hall" at the stage end of the theatre and this is shown in the model (Fig. 1). This is not being built as an element of the initial construction program and is presently considered as a part of a later plan. The concept is interesting. Large double doors will be provided so that this area, too can have visual communications with the theatre. It will be provided with a special floor, with mirrors, and with ballet bars so that it may function as a ballet hall or as a regular rehearsal area.

The amount of rehearsal area provided in the complex is a feature. In addition to the planned Playback Studio, there is a rehearsal area of equal size under the theatre and a smaller rehearsal area on the studio floor level (see Fig. 7). By providing these large rehearsal areas, the rehearsal time needed in the production studios is reduced, making for more "cost effective" use of the studio facilities.

Other production areas

TV Studio 4 is a small studio intended for interview programs. It has a floor area of 64 m² and is provided with two permanent cameras. There are also two 50 m² announcer studios each with one permanent and one assignable live color camera.

It also should be noted that ORF will continue to operate its color TV studio presently in operation at the Rosenhugel location. This studio has a production area of 600 m², is equipped with modern color equipment, and has extensive scenery construction shops associated with it. In fact it is planned that most scenery construction will be done at this location which is about 3.3 kilometers from the Zentrum Wien site.

Fig. 17. The roofs of the studios are made up of T-shaped reinforced-concrete beams. The vertical sections of these beams provide rigidity and a convenient place for attaching the hangers which support the overhead structure.

Fig. 18. The acoustically isolated hangers support a grid structure with a slotted metal floor on which lighting men can walk around to move or elevate the lighting fixtures which are suspended on telescopes beneath it.

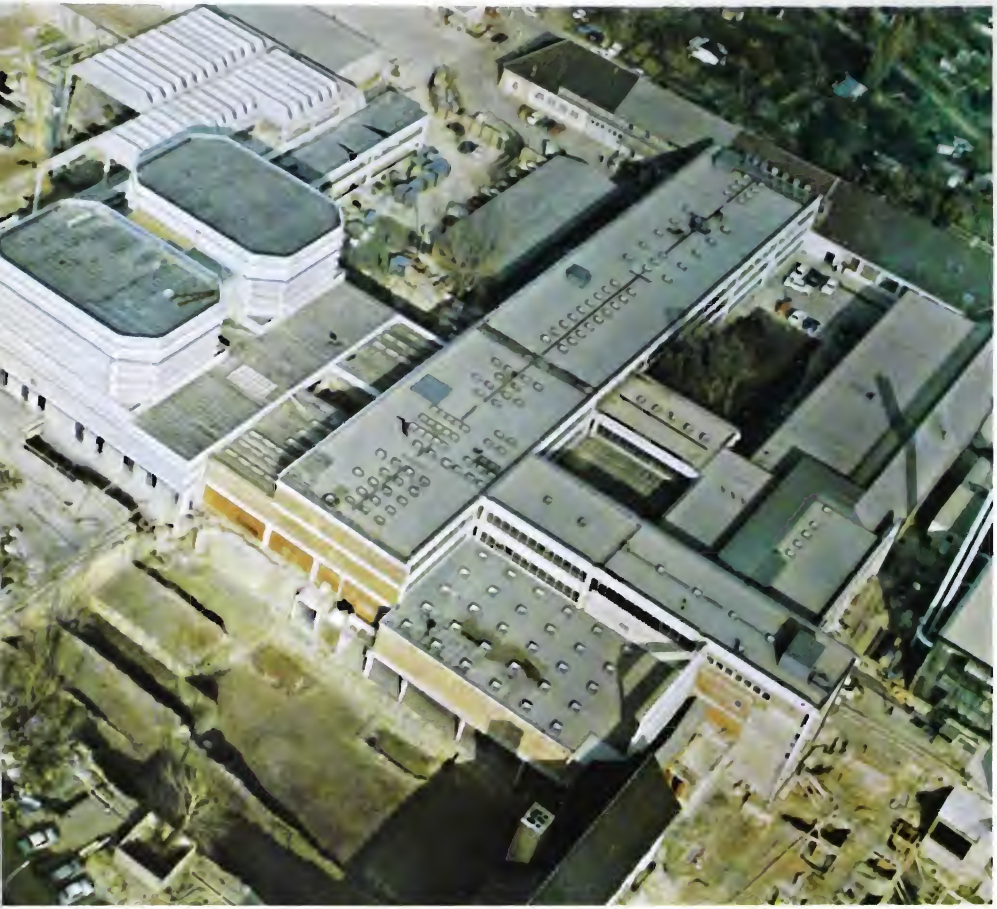


Fig. 19 In this view of the complex under construction, the low building (bottom, center) with the many skylights is the central machine room. The central equipment room and master control area is between the machine room and the studios. The area at the bottom left of this photo is where the main office building will go. From the first floor lobby of the office building the central machine room will be visible thru a larger glass wall.

Centralized Equipment Pool Improves "Cost Effectiveness"

The centralized equipment concept

Studio layouts and programming requirements having been decided, the next step for RCA engineers was to work out the specific equipment required and the optimum arrangement of this equipment.

A key feature of the RCA proposal for ORF was the full implementation of the centralized equipment concept. In such a system all of the video sources — i.e. tape machines, telecine cameras, and live cameras — are placed in an equipment "pool". Master control "assigns" individual equipments to the control of the various control rooms (studio, operations, auxiliary, tape, or film) for the specific periods for which they are needed. The assignments are made by means of five TS-50 Assignment Switchers (one each for live cameras, film cameras, tape machines, monitoring, pulse distribution) which switch control to the specified control points.

The great advantage of the centralized system is that it enables the high cost video source equipments to be used much more efficiently and hence reduces the total number of such equipments which need to be installed. ORF's Technical Director, Dipl.-Ing. Wassiczek has estimated that by adopting the centralized system ORF saved about 90 million Austrian schillings (approx. $4 million) in original investment and that there will be a saving of about 1 million schillings annually in operating staff costs.

The use of the centralized equipment concept on a large-scale was first introduced by RCA engineers in the planning and installation of studios for KRON-TV, San Francisco in 1966 (BROADCAST NEWS Vol. No. 131, December 1966 and BROADCAST NEWS, Vol. No. 144, June 1970).

At the time Zentrum Wien was being planned (in 1968 and 1969) RCA was the only manufacturer to propose such a system. Since then the idea has become generally accepted as the most "cost effective" approach to large systems planning.

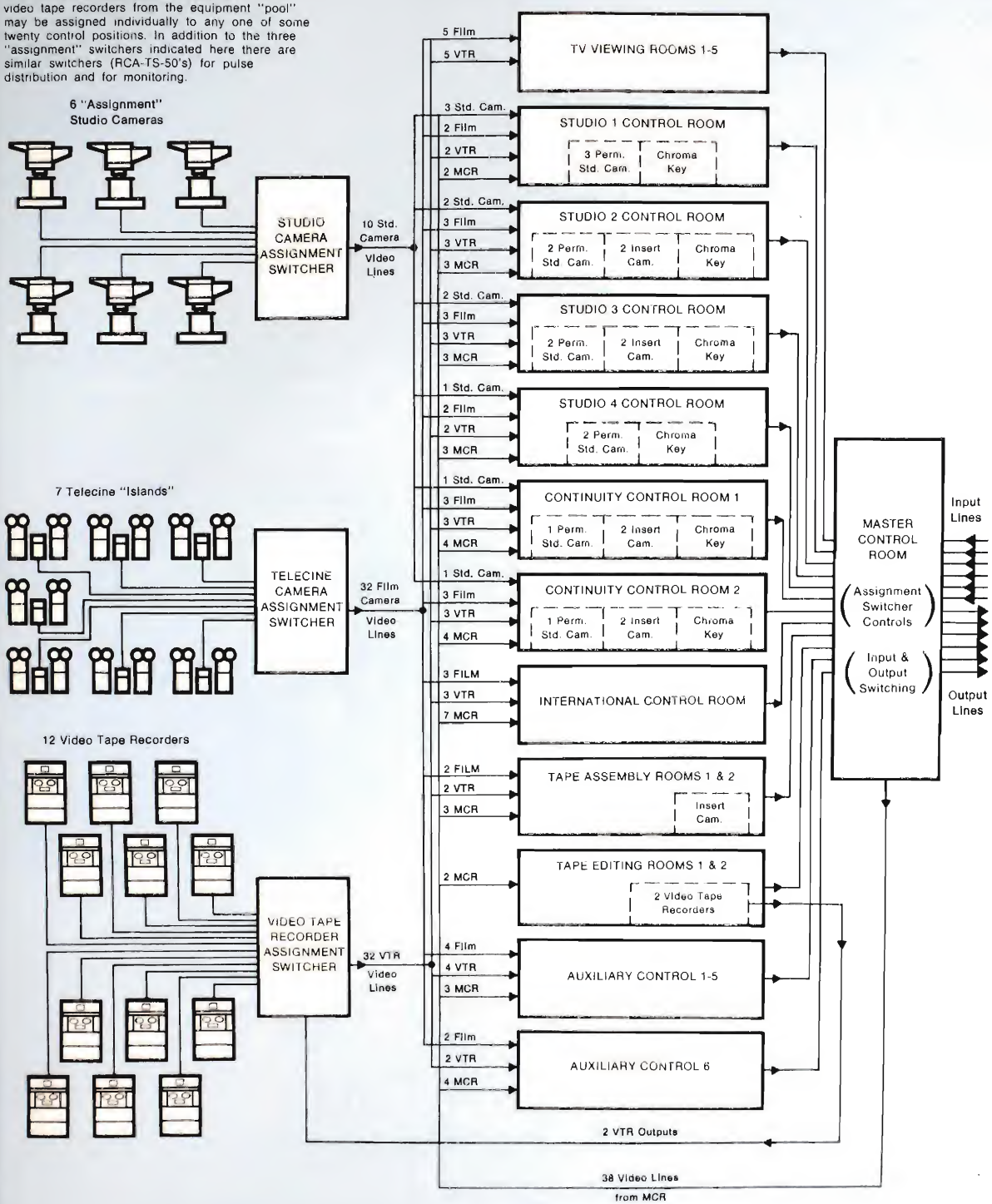
The technical complex

Having decided to use the centralized equipment concept, the next step was obvious — to group all of the equipment and equipment control areas (except live studio control rooms) in a centralized technical complex. Installation-wise this makes for short inter-connections and minimum costs. Operation-wise it provides maximum convenience and minimum costs.

The technical complex is located in a compact one-story building area on the ground floor of the overall complex. This area is located at the rear of the entrance lobby of the main building, from where it is visible through a large-area glass wall. Thus it constitutes not only the functional nucleus of the Center but also a primary focal point within the building complex.

Included in the technical complex is the master control room, the continuity control centers, the auxiliary control positions, the viewing rooms, the central equipment room, the tape recording sub-complex, the central machine room, and the international control complex. The locations of these sub-areas of the technical complex are indicated in Fig. 21. A brief description of each follows.

Fig. 20 Simplified video circuit diagram illustrating how studio cameras, telecine equipments and video tape recorders from the equipment "pool" may be assigned individually to any one of some twenty control positions. In addition to the three "assignment" switchers indicated here there are similar switchers (RCA-TS-50's) for pulse distribution and for monitoring.



Grouping of Technical and Control Areas For Maximum Operating Convenience

Central machine room

Following the concept of centralized machine placement, all of the film machines and those tape machines used for programming and news exchange will be placed in this large (27 m by 22.5 m) room, which is shown at the bottom right in Fig. 21. Eight TR-70 video tape recorders will stand along the north wall of the room. In front of these are spaces for an eventual 16 telecine chains—nine of which will be installed in the initial stage. Ten 16mm projectors, nine 35mm projectors and seven slide projectors will be positioned in these seven islands.

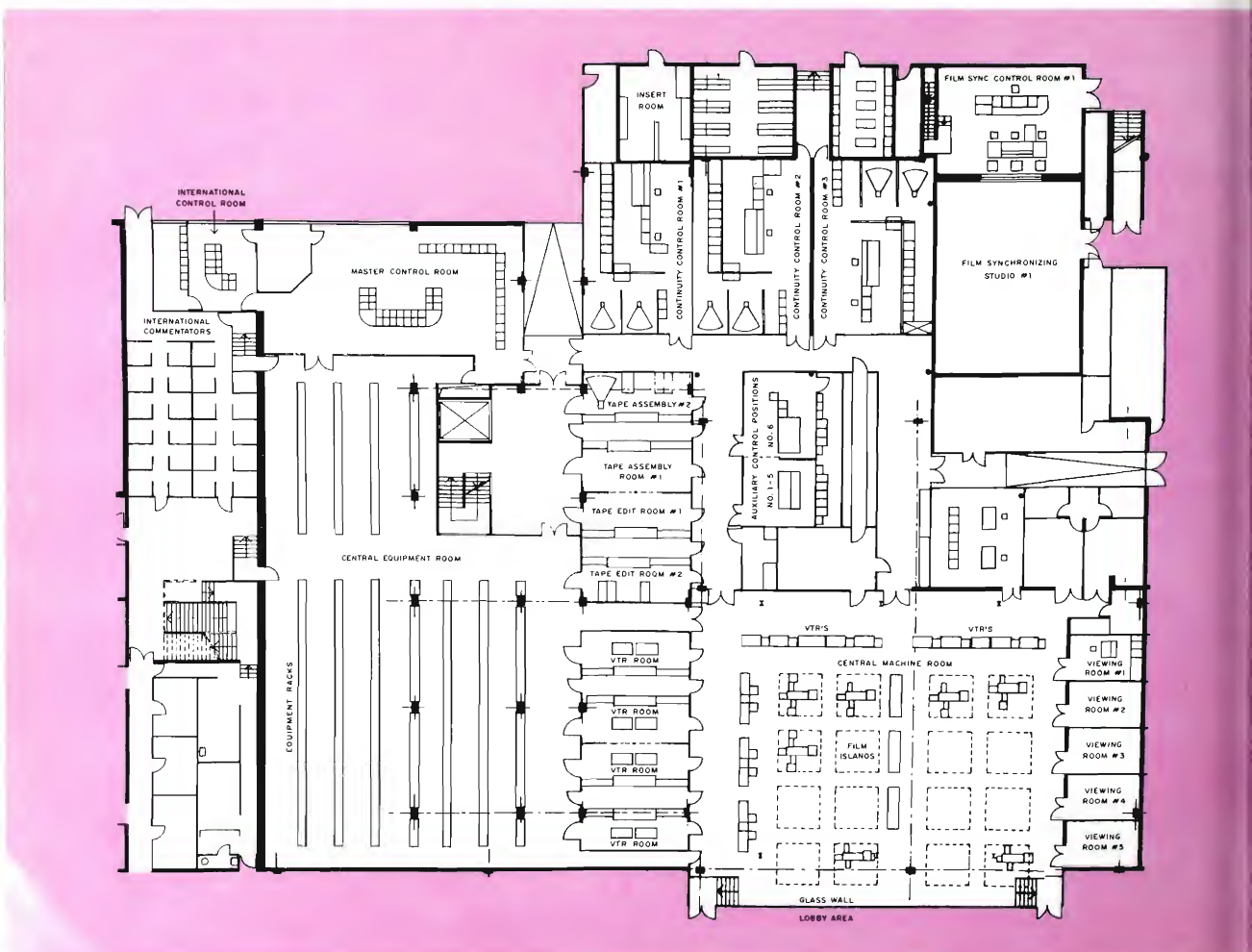
All of these machines, plus 16 additional VTRs located in the immediately adjacent tape sub-complex (see below) will be a part of the machine pool. They will be assigned by the operator in the master control room to operating positions (studio control, auxiliary control, continuity control, etc.) as called for by the day's schedule. The pushbuttons on the master control console activate assignment switchers which transfer start, stop, and adjust controls for each machine to the assigned control position.

Because the actual operation is controlled from remote points, the men in the machine room need only load the machine, set the adjustments to previously calibrated positions, turn the machine on, and place it in the remote-control mode. As they do not have to stay with the machines during running time, a very appreciable saving in staff cost results.

Viewing rooms

The procedure which makes this unattended operation possible is interesting. At the right of the central machine room are five viewing rooms (there are five more in other locations). These will be used mainly for viewing — and calibrating — incoming film. Because the film machines are to be operated unattended (by remote control from the central positions to which they have been assigned) some provision must be made for necessary color and density compensation. The procedure will be to bring all newly-received film to the machine area, set the film up on one of the islands, and feed the output to one of the viewing rooms. Here it is viewed for quality, calibrated, and necessary chroma and density

Fig. 21 Floor layout of the technical complex showing arrangement of equipment and control room areas. The location of this area with relation to other areas of the complex is indicated in Fig. 6.



corrections determined and marked on a card which is attached to the film container. It is then sent to the archives till needed. On the morning of the day it is to be used it is brought back to the film distribution area (adjacent to the machine room). Just before air time it is set up on the assigned machine, the calibrated corrections are dialed in, and the machine turned on. It is now ready to be operated remotely from whatever control position it is assigned to.

To facilitate the calibration process each Viewing Room will have a control console containing remote machine controls for telecine and tape machines, and monitoring facilities such as PPM meter, waveform monitor and vectorscope. Color picture monitors will be mounted in the wall facing the console.

Tape recording sub-complex

To the immediate left of the machine room (Fig. 21) and opening off of it are a series of rooms which make up what might be called the tape recording sub-complex. This was a concept of ORF operations and one which they considered particularly important because of the large part recording plays in their operations. This sub-complex consists of eight rooms of three different types.

(a) Tape recording rooms

At the bottom, in Fig. 21, are four regular recording rooms — each containing two TR-70C Tape Recorders. These are primarily for program production recording. One interesting feature is that the two machines in each area back on to a maintenance area — so that maintenance men can take a machine away for servicing without entering the recording area.

(b) VTR edit rooms

Just above the tape recording rooms (Fig. 21) are two tape editing rooms. The primary purpose of these rooms is the assembly and editing of taped programs. Each room will be equipped with two TR-70C Video Tape Recorders, and a TS-51 Vertical Interval Switcher for selecting inputs and for switching between the two tape machines. The outputs of the two recorders are also fed into the VTR assignment switcher to allow these machines to be used as general playback machines for the studio complex.

(c) Tape program assembly rooms

Above the edit rooms are the third type of tape room — the Tape Program Assembly Rooms. Each of these represents a small scale production facility which can be used to assemble program material originating from various signal sources into continuous video taped programs — and do so without tying up any of the studio control rooms. The equipment in each room will include two tape recorders, a TS-51 Switcher,

Fig. 22 Simplified video and control schematic showing divisions of equipment between studio, equipment room and control room for Studio 1, 2 or 3. Solid lines are video circuits, broken lines are audio circuits and dashed lines are control circuits.

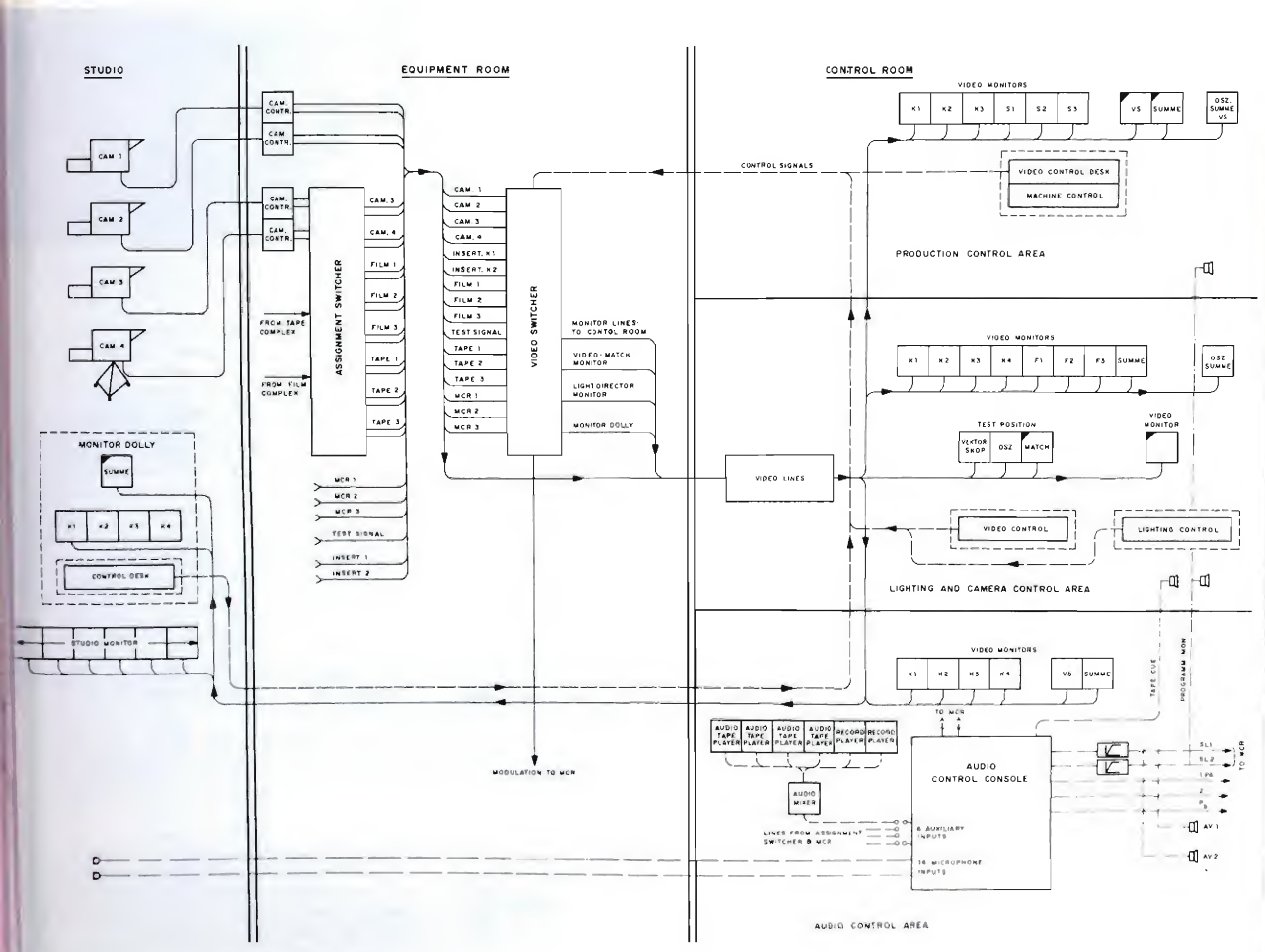


Fig. 23 A view in the master control room during early stages of installation. Operators sitting at the console will face a large group of monitors and read-out displays which will be mounted in the wall opening which can be seen at the rear in this picture.

Fig. 24 Another view of the master control room. Switching for input audio and video lines is located in the left section of the U-shaped console; output switching in the right section. Assignment switching and internal signal distribution controls will be located in the center section.

monitoring equipment, and an operating console. On the console will be machine controls (for remote operation of assigned machines) and the TS-51 selector controls which will allow selection of feeds from sources such as insert cameras, test signals, and lines from master control.

The VTRs in these rooms also have their outputs connected to the VTR assignment switcher so that if desired they, too, can be used as a part of the pool.

Auxiliary control rooms

Located near the center of the technical area (just across the aisle from the tape rooms) are two auxiliary control rooms. One will contain five auxiliary control positions; the other a single, more sophisticated position. The function of these control positions is to provide technical control, switching, and monitoring of the video-audio feeds used for special purposes such as program previewing. For each position there will be a console containing the controls for remote operation of tape and film machines (assigned to it by Master Control), and for selecting between 13 input video lines.

Automated continuity control centers

At the top center in Fig. 21 will be noted the position of the three operations control rooms (sometimes referred to as continuity control rooms). One of these is the operating center for the "First Television" network. The second is the operating center for the "Second Television" network. The third, which will not be equipped until later, will be a reserve operating center.

In each of these centers will be an eight-section custom-designed control console at which will sit a camera control operator, a video switching operator and, if required, an audio control operator. The camera operator controls the remotely-controlled camera in the announce studio, two insert cameras, and the film cameras and tape machines in the machine room (which have been assigned to him by master control). The switching operator can make his switches manually or he can have it done for him automatically. To effect the latter each center is equipped with an RCA Vid-Au-Mac Automated Control System. This system, which has been previously described, provides automatic, pre-programmed, video and audio source selection and switching — including start, stop, and pre-roll of film and tape machines as required for a long period of programming. Inasmuch as most ORF programming is from tape or film, it provides for fully automated operation over most of the day.

Central equipment (rack) room

In the large room at the left in Fig. 21 are grouped most of the equipment racks for the whole installation. The only exceptions are a small number of racks containing operating controls or test equipment which must be located in the control rooms. There is space for nearly 300 racks — and most of it will be used. Mounted in these racks will be the camera auxiliary equipment, the assignment switching systems, audio and video switching systems, patching systems, intercom equipment, etc.

None of the equipment in this room requires attention during normal operation. Except for the patch panels, everything in this room is controlled from somewhere else — mostly the control rooms. Thus with the exception of routine maintenance this is a "dead" room.

In order to facilitate installation, possible changes, and later expansion, everything in this room — floor, racks, etc. — is elevated 50 cm above the concrete floor. The racks themselves are mounted on a specially designed steel framework (Fig. 26) which has adjusting devices in each leg so that perfect levelling can be obtained. Between these rack base frames will be placed a hollow "computer-type" floor having a height the same as the frames.

Fig. 25 The RCA men who are supervising the Zentrum Wien installation. Left to right: Robert J. Venner, Project Manager; Dr. G. E. Urbanek; Dipl. Ing. Martin Pollner; and Ian Brown, Project Engineer. Jim Kohler (see Fig. 33) is Project Administrator.

MCR "Assigns" Equipment, Switches Incoming and Outgoing Lines, Controls Internal Signal Distribution

Fig. 26 The control equipment room before installation of the equipment racks which will rest on the frames seen here. Spaces between the frames will be filled with "computer-type" floor at the same level as the height of the frames. This will provide maximum convenience in installation and maintenance.

Master control room

The Master Control Room is just north of equipment room (as seen in the layout of Fig. 21. In the center of this room will be a large U-shaped control console made up of fifteen standard RCA console housings into which are built the controls to operate the audio and video signal switches which are utilized for input signal selection, signal distribution, and output signal switching.

The control panels associated with audio and video input signal switching (and monitoring) are grouped in the left section of the console. In the right section are the control panels for output signal switching and monitoring. In the center section of the console are located the Assignment Systems Control Panels, the Video Switcher Control Panel, and the Monitor Switcher Control Panel.

The operator at this position pushes the buttons that actuate the assignment switchers that transfer control of assigned machines as scheduled. An elaborate display board indicates what machines are assigned to what control positions at all times. Appropriate sections of this "read-out" display are reproduced at the control and machine positions.

Elaborate Provisions For International Program Exchange

Eurovision-Intervision Interface

ORF occupies a unique position in international broadcasting in that it is the officially designated "interface" or connecting point between Eurovision and Intervision. Thus it is connected by permanent microwave lines both to Brussels, the technical center for the Eurovision network, and to Prague, Czechoslovakia which is the technical (and program) center for the Intervision network. There is also a microwave line to Zagreb, Yugoslavia, so that the Yugoslavian television system may be connected to Eurovision.

The Eurovision-Intervision exchange is ordinarily accomplished by ORF tape recording the Intervision news programs, editing them, and re-transmitting parts of them to the regular Eurovision news exchange. At the present time the countries in the Eurovision net exchange news at two specified times (1700 and 1930 hours) each day. At this time the several countries in turn feed news material into the network while the other countries record it in order to use such parts of it as they wish in their own news programs. The items which each country is to feed into the network that day are decided each morning by a party-line conference of all the chief editors of the European organizations. At this morning conference the news editors of ORF, besides offering their own news items, also read to the other editors a summary of the Intervision news offers. If any of the other countries express interest, then ORF feeds the Intervision contributions into the Eurovision system during the regular news exchange period.

In case of broadcasts of unusual interest, the two networks may be tied together directly for a "live" broadcast over both networks. The exchange can go in either direction — and by satellite to the United States, and to countries on other continents. In addition to the network interchange, ORF occasionally handles interchange of programs between individual countries—as, for example, between Russia and France.

International control room

The unusual network interconnections ORF is called upon to make are handled in a so-called International Control Complex. The technical part of this complex is located directly adjacent to the master control room (Fig. 21) while the program part is located in the news wing of the building complex.

The International Control Room (top left in Fig. 21) will contain a seven-section control console on which are mounted the controls for the TS-51 Switcher which controls the feeds to and from "Brussels", "Prague" and "Zagreb", together with all of the requisite audio and video monitoring devices. The inputs to this switcher, in addition to the incoming international lines, also include lines from master control and from film and tape machines which may be assigned to the operating position by master control just as it assigns machines to the other control rooms. A simplified schematic diagram of the ORF international circuits is shown in Fig. 23.

International commentator area

Next to the International Control Room (Fig. 21) is a large area which is divided into twenty-two small booths. These may be used in the case of special events by announcers of various countries who wish to put their own commentary (in their nation's language) on a program being transmitted to their country by microwave line — or being taped for transmission. In each booth there is a headset, a microphone, and a standard EBU commentator box which has facilities for switching, telephone call buttons, a monitor, etc. The commentator sees the video on his monitor, hears the original sound on his headset, and speaks concurrently into his microphone. Each booth has its own audio line out — plus a line which carries original background sound. In the International Control Room the booth output audio lines are routed to the lines to the commentator's own country — or to machines for taping.

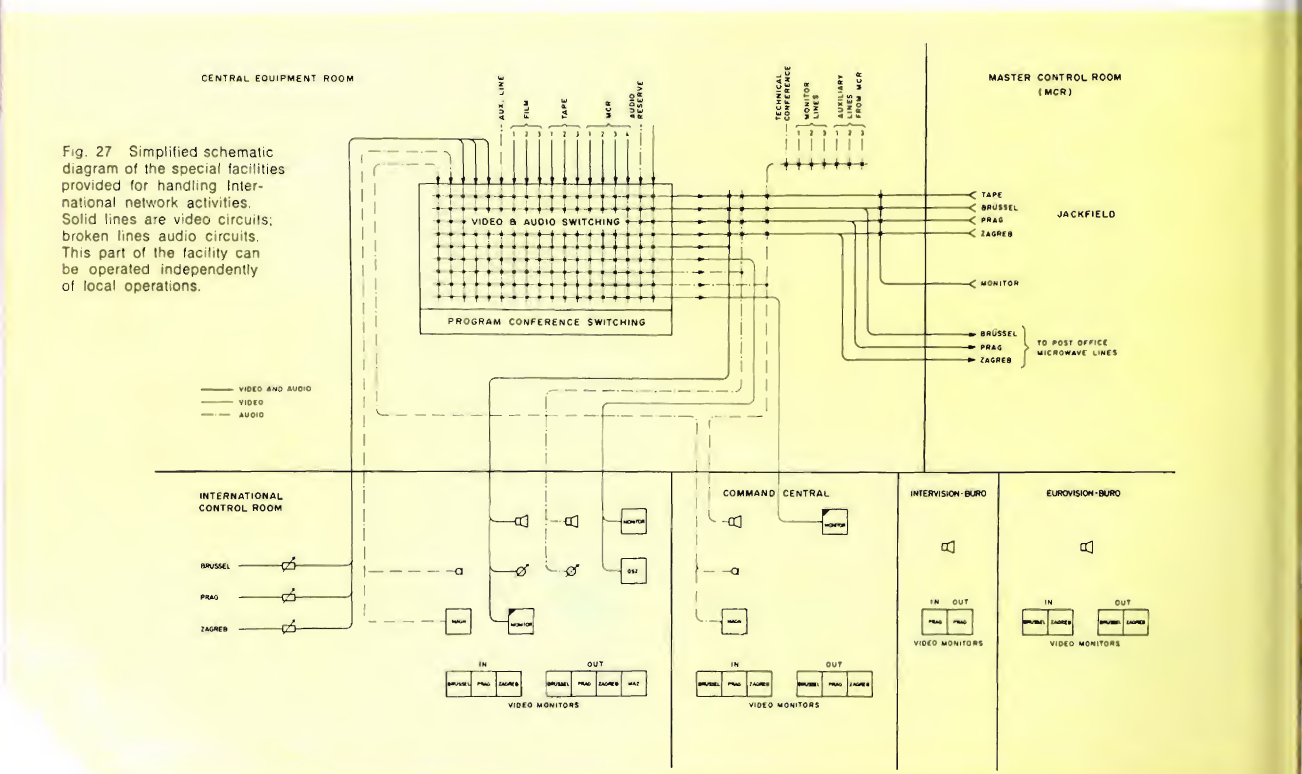


Fig. 27 Simplified schematic diagram of the special facilities provided for handling International network activities. Solid lines are video circuits; broken lines audio circuits. This part of the facility can be operated independently of local operations.

Extensive Film Editing and Dubbing Facilities

Film synchronizing studios

As previously noted ORF depends very heavily on films obtained from broadcasting organizations in other countries. Many of these must have new sound tracks dubbed to replace the original. It adds up to a lot of dubbing and Austrian engineers are meticulous in their determination to achieve proper synchronization of sound and picture.

With this extensive need in mind, very elaborate film facilities have been built into the Zentrum Wien complex. There are two large synchronizing (dubbing) studios, each provided with a large control room containing an elaborate mixing console, audio tape recorders, etc. Above each control room is a projector booth containing a number of 35mm and 16mm projectors. One of these synchronizing studio complexes is located in the central technical complex (upper right corner, Fig. 21). The other is located in the low building wing at the right rear of the office building.

In addition to the film studios there are numerous rooms for film viewing and editing, rooms for re-recording, and areas for developing monochrome and color film. All of these telecine facilities have been completed and are in operation.

Radio studios

Eventually ORF will locate its radio operations (as well as TV and administration) at the Zentrum Wien site. Two things mitigate against doing this immediately; one is cost, the other is that ORF presently has relatively satisfactory radio facilities on the Argentinierstrasse in downtown Vienna. Thus most radio shows — including music shows, talk shows, etc. — and radio continuity operations control will continue from there. However, because all news operations will be located at Zentrum Wien, it is planned to produce all radio news shows, and some radio interviews, at the new site.

The radio studios planned as part of Zentrum Wien are modest in overall size but well-planned for the purpose envisaged. The studio complex — located on the second floor of the heptagonal building at the far right of the complex (Fig. 8) — includes two interview studio complexes. Each of these includes, in addition to the studio, an announcer's booth, an audio control room, and a production control room. Centered between these (Fig. 8) is an operations (continuity) control room with an announcer booth opening off of it. Thus it is possible to originate, simultaneously, three radio news or interview type programs.

Fig. 28 One of the projection rooms in ORF's extensive sound dubbing facility. Film projectors which project film on to screen in dubbing studio are in foreground. At the rear are sound recorders used in dubbing and editing operations.

Fig. 29 Looking from the control room of one of the dubbing (synchronizing) studios into the studio proper. ORF uses many films from other countries and its facilities for dubbing new sound tracks on these are very elaborate.

"Energy Central" Supplies Power, Heat and Air-Conditioning

Fig. 30 Power source for the whole complex is in this building—called "Energy Central". Here are located main air conditioning units, emergency generators, boilers, etc.—and all power control. A fuel oil storage tank stands just behind this building.

Fig. 31 Heat, air-conditioning, power, hot and cold water, control cables, intercom and telephone circuits, etc. are distributed throughout the complex by a series of "energy canals", such as that shown here, which run like a maze under all the buildings.

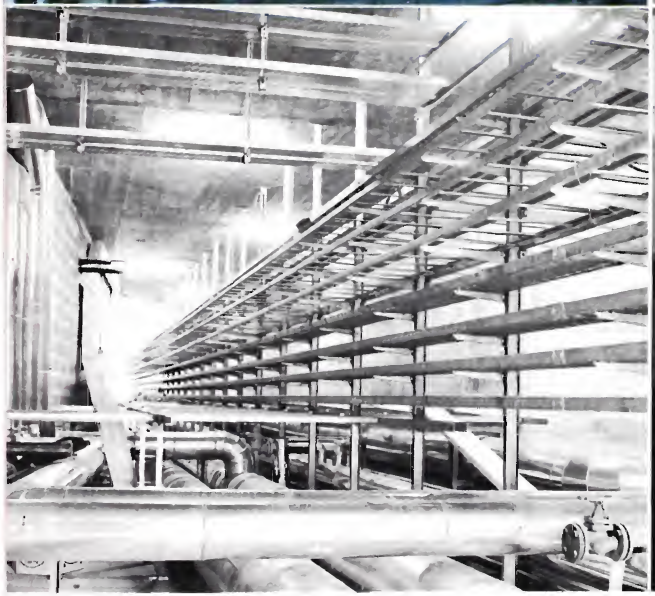


Fig. 32 The energy canals are 3 to 4 meters high and about as wide. In some there is a grid-like floor underneath which the large pipes are placed while wires and cables are layed on racks as those shown at the right in this view.

Fig. 33 Office of Jim Kohler, RCA Project Administrator. The large chart on the wall is a "major event flow chart". The RCA team uses this chart and the "critical path method" (CPM) to direct and control the logistics of the whole project.

"CPM" Provides Continually Up-dated Picture of Overall Progress

Energy central—energy canals

The main power source for the complex is the building called "Energy Central" at the right rear in Fig. 4. In this building are located three large air-conditioning units, two 360 kW power generators for emergency use, boilers, transformers and complex controls for the power, heating and cooling needs of the whole complex. A fuel oil storage tank stands just behind this building.

Heat, air-conditioning, power, hot and cold water, control cables, intercom and telephone circuits, etc. are distributed throughout the complex by a series of "energy canals" which are tunnels 3 to 4 meters wide, and about as high, which run like a maze under all the buildings. The size and construction of these (Fig. 31) is such that men can easily walk upright through them — and cables or pipes can be serviced or added to in the most easy way.

In most areas power is distributed at 220 volts. However, areas such as the studios, which require large amounts of power, are serviced by sub-stations located close by. Power goes from the energy control to these sub-controls by 10kV cable. Located just under TV studio 3 is a large sub-central which not only supplies power but also air-conditioning for the studios. Because these place heavy loads on the air-conditioning only for certain relatively short periods, it is most efficient to have them on a separate system. Under the technical and production areas of the complex there is a second, less extensive, series of tunnels called the audio-video canals. These tie all of the control and machine rooms together, providing the shortest possible connections and simplifying the installation work.

The logistics—use of CPM

The logistics involved in planning, constructing, equipping, and testing out a project the size of Zentrum Wien are staggering. If one considers the technical standards to be met, the complexity of the equipment involved, and the need for close coordination with a construction program extending over nearly five years, it is hard to imagine a more difficult project. Every part of the project down to the smallest unit has to be planned, specified, ordered, delivered, installed, and tested—on schedule. RCA, as project administrator, has the responsibility for doing it.

To accomplish this Herculean task, RCA has a resident project team in Vienna and another team in Camden (where, of course, all of the facilities of the Broadcast Division are available as backup). The first job, of course, was to plan the system — working with the ORF operations staff; the second was to work out the design details. That done, they had to plan where each part and piece was to be obtained, where it was to be shipped, how it was to be worked into the construction schedule, what manpower would be necessary, etc. Because the total equipment includes power, lighting, telephone, and other items which RCA does not make, it was necessary to plan on getting these from other suppliers. A tremendous coordinating job is involved, and meeting of schedules is all important.

The RCA team uses all the tools of modern project management to do it. It starts, of course, with the major event flow chart. This is a diagram which shows not only the scheduled mileposts for each element of the plan but also the interrelationships between these mileposts. With this chart established, the critical path method (CPM) can be utilized to process the data. Using a computer, information is derived which shows the earliest and latest possible starting and completion dates for each segment of the schedule. As the job progresses, updated information is fed into the computer which can identify from day to day the critical activities that make up the so-called critical path.

The use of CPM provides a continually updated picture of overall progress, it identifies trouble spots at an early time, and it can be used to evaluate alternatives for "working around" delayed events. Its use keeps all of the various activities working steadily — instead of having some wait for parts that were never ordered, or delayed, or damaged. In a project of this size it is almost indispensable. RCA engineers, having used CPM for several years on major projects, are experts in its application. Its use on the Zentrum Wien project may be almost as important a contribution as the design of the system.

Summary—more to come

In the pages that have preceded, the background, the planning, and some of the ideas and equipment which are going into the ORF Zentrum Wien complex, have been explained. With the buildings just rising out of the ground, and operation still some time away, it has not been possible to completely picture the complex as it will look and function when complete. Nevertheless, it was felt that the planning in itself (together with a discussion of some of the concepts) was of such interest as to justify this early article. BROADCAST NEWS will present follow-up articles on Zentrum Wien as the project moves toward the completion of the "grand design" envisioned by ORF management, Dr. Rainer, and the RCA engineers who worked on it.

Radio/Television BEOGRAD...on the move

RTB Selects RCA

The RCA/RTB mobile van at Montreux . . . open house at the latest color television studio on wheels.

Radio-Television Beograd (RTB) is Yugoslavia's largest TV station and is one of the six virtually autonomous television stations in the country (each serves one of the Republics of Yugoslavia).

They are completing a station expansion program that will permit them to provide high-quality color telecasts of topics of national interest, such as sports, cultural affairs, community meetings and other activities originating either in their studios or elsewhere in the Republic of Serbia. They will also be "mobilized for color," because the new studio complex will be complemented by their first color mobile unit—one of the most sophisticated OB (outside broadcast) vans ever built.

In July, 1970, a contract in excess of $1.5 million was awarded to RCA, covering equipment for the new studio complex in Belgrade and a mobile telecasting unit. Although the permanent studios are still under construction and will not be fully operational until December of this year, the van went into service recently and has already added a new dimension to the station's daily bill of fare.

From Ohio to Belgrade in 200 days

Physically, the mobile van is a "true" bus configuration, 10.7 meters long, 2.4 meters wide (overall) and 3.8 meters high (measured from road surface to roof). It is powered by a GMC V6 engine, generating 254 gross hp. The custom-built body was fabricated by an RCA sub-contractor in Ohio within 120 days from chassis lay-out. All equipment installation and final checkout was accomplished in 37 days at the RCA Custom Repair and Engineering Shop in Pennsauken, New Jersey (220 Bldg.). When it was finished and reviewed by the customer, who was in the United States for final acceptance tests, the van had to be delivered to RTB, so its journey to Yugoslavia from RCA 220 Building was in itself quite a feat.

The first destination in the journey was the 7th International Television Symposium and Technical Exhibition, Montreux, Switzerland, in May where it was exhibited with the permission of the customer. From Pennsauken the van was driven to the Port of Newark, New Jersey, where it was transferred to a "containerized" vessel bound for Bremerhaven, Germany. A railroad flatcar brought it to Basel, Switzerland, and then it was driven, over 160 Km of mountain roads, to Montreux to become one of the major attractions at the RCA Pavilion. After the 10 days of the show it departed on the 1,700-Km journey to Belgrade, where it arrived on June 5. From Ohio to Belgrade it had traveled more than 10,000 Km.

Equipped for complete color operation

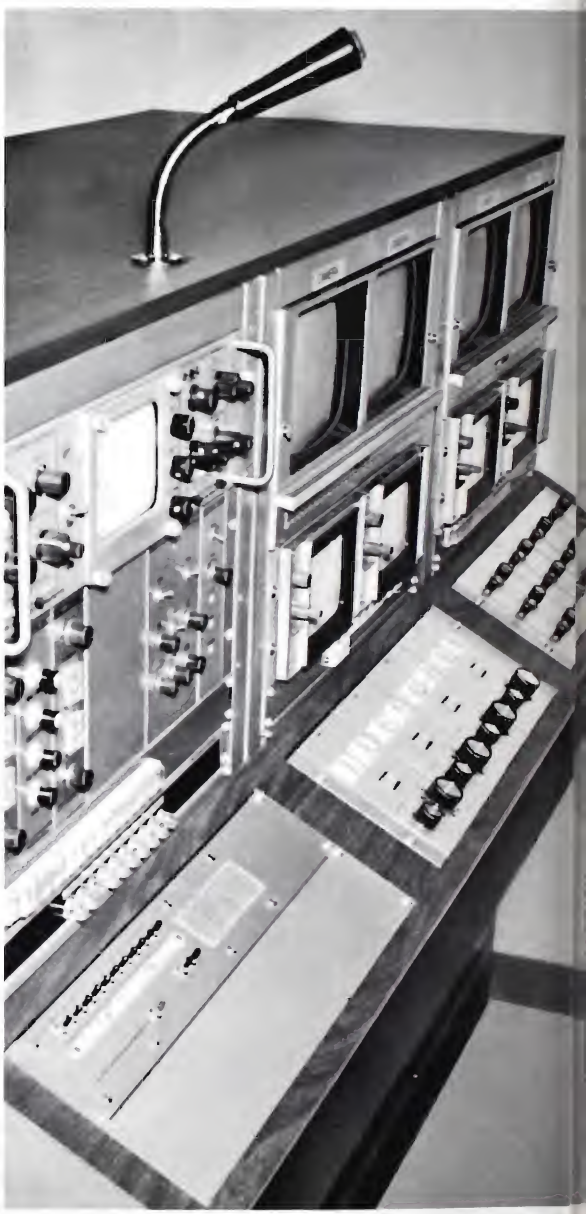
The heart of the van is its complement of four TK-44A color cameras, each of which is equipped with zoom lens, exclusive RCA "Chromacomp" color control module and all of the other characteristics and technical capabilities that have made it a leader in the broadcast industry. The TK-44A's feed a TS-51 production video switcher that has built-in capability for over one hundred special effects.

At the front of the body, a complete audio control center features a BC-100 audio console that permits the control and mixing of 36 microphones and 25 high-level inputs into 4 separate and/or simultaneous output channels. Two independent outputs are available to drive separate reverberation units. In addition it has a built-in, multi-frequency test oscillator that can be switched into any input or output and a fold-back output channel. Audio tape recording and playback facilities include two RT-21 reel-to-reel machines and an RT-16 broadcast cartridge player that provides six simultaneous and independent program channels. The tape machines are installed in a rack that also contains full patching and monitoring units. The audio compartment, video director's console, cameramen, CCU's, external video tape van(s) and support areas, such as lighting director and assistant, floor director and assistant and commentator, are interconnected with the new BCS-5000 intercom system to ensure continuous coordination. The BCS-5000 offers both selective and multiple station call. Communications between the van and the studio complex in Belgrade are maintained by a "Super-Carfone" VHF two-way radio installed in the cab. The multi-channel antenna for this

Mssrs Jovan Valcic and Borivoje Sreckovic of RTB run through vision mixing sequence in master video control compartment.

Compact control section houses CCU's of four TK-44A camera chains.

BC-100 audio switching center provides high-fidelity matrixes of microphone and high-level inputs.



unit can be elevated to a height of more than 6 meters via a pneumatically-operated aluminum mast that telescopes into the roof of the van's body.

Complete power supply and environmental control system

The OB van tows a four-meter long, trailer-housed, diesel-powered alternator, uniquely reverse-mounted, so that it can supply full power even when the van is in motion telecasting special events. The alternator serves all of the electronic equipment and an innovative climate control system that incorporates heating, cooling and automatic dehumidification into a single unit. The alternator trailer also carries a spare tire for the bus.

The integral air conditioning system offers several distinct advantages. It is mounted above the cab in what is normally unused space, thus providing more room in the van's body for electronic equipment and operating personnel. It is a "ducted" system, so its discharge and return ducts permit a controlled environment, which helps to increase the efficiency of equipment and staff. Distribution of air is regulated via four-way adjustable louvers, eliminating "hot-spots."

When electric power is not supplied to the van via the alternator or mains, a special auxiliary gasoline, "chill-chaser," provides temporary interior heat.

Optimum construction advantages

This versatile mobile color television production center illustrates the complete attention the team of engineers from RCA and RTV-Belgrade paid to the station's OB van requisites. To accommodate RTB's programming techniques a variety of new concepts were devised. The stability provided by a deluxe, "air-ride" suspension system, and high-flotation tires assure satisfactory performance when the bus must travel over unimproved roads and/or negotiate hilly terrain. The tires are of a wide-based design, measuring 42 x 56 cm, so single-tire tandems, instead of "duals," are used. They can be inflated by means of the van's self-contained, 12 cu. ft., quick recovery compressed air facility, which also provides air pressure for the brakes, suspension system, pneumatic mast and maintenance and repair tools.

The compact body of the bus is arranged to provide both sufficient storage for equipment and easy access to utility and service panels. Compartments are available to store the camera heads, tripods, viewfinders and lenses, cables and everything else required for immediate operation. Cabling and wiring for equipment is in a central trough below the floor of the bus, while wiring for lights, air conditioning, control and auxiliaries is installed above the ceiling. The exterior roof is steel-plated to allow for camera operation from its surface.

For Yugoslavia . . . a new dimension of color capability

In summary, this modern, custom-fabricated unit typifies many advances in mobile television service. Now, RTB can schedule a greater variety of television events to keep their public better informed of daily community happenings. As a supplementary benefit, the van can visit neighboring countries and relay aspects of their cultural, entertainment and educational activities back to Belgrade, via the Eurovision and Intravision networks.

With this new degree of telecasting capability, the engineers and staff of Radio-Television Beograd hope to significantly increase their nation's color television programming, as they bring all of the action, drama and spectacle of sports and other outdoor and remote festivities to their audiences.

For RCA . . . a continuance of mobile television excellence

Over the years, RCA has produced many mobile broadcasting units for stations and production companies throughout the world. Vehicles have been supplied equipped with monochrome and/or color cameras for telecasting activities that originate either outdoors or in locations away from the studio. Other units have contained video tape machines for direct recording of events as they occur, for immediate or delayed playback. Sometimes cameras and VTR's are integrated to provide both live and video taped pick-ups. And, supplementary sound trucks or vehicles housing the variety of support systems, power auxiliaries and RF signal transmission facilities are often included.

For the television station manager, the deluxe studio-on-wheels represents an excellent solution to his problem of bringing virtually any locale into the homes of the public. By producing more and better units, RCA introduces a new level of operational performance and programming creativity to remote telecasts.

RCA extends its special thanks to Messrs. Antic, Mitrovic, Yelacic and Zizic, the engineering directors at RTB responsible for the acquisition of the OB van. They cooperated most completely and cordially in providing many of the facts necessary for the publication of this story. ■

Television in the Rhineland

the story of Westdeutsche Rundfunk

Westdeutsche Rundfunk, or WDR, stands for "West German Television." WDR is one of eleven stations in West Germany's ARD* network and supplies the ARD with approximately 25% of the total of its live, film and video tape programming. To maintain this output, WDR is extensively equipped with modern, sophisticated facilities for the televising of events produced in its studios or picked up from other locations. The station is staffed with a highly proficient group of engineers, production and programming personnel. You will find them at the major broadcasting conventions in Europe, the United States and throughout the world, as they ensure that WDR provides optimum service by keeping abreast of the latest developments in the industry.

WDR: In the shadow of the DOM

In visiting the main television studios and training center of WDR in downtown Cologne, you are immediately impressed by its location—only a few blocks from the fabled Rhine River, it sits hard by the "DOM," the massive 12th century Cathedral with twin spires towering 150 m. into the sky. Practically underneath the station structures is a small city of partially excavated ruins dating from as far back as 200 B.C. The four-building studio and control center complex on Wallrafplatz is almost as impressive as its locale, for this is a thoroughly modern plant, initially planned in 1958 and fully commissioned by 1966. Besides the live camera, video tape and telecine studios, the center houses control, switching and terminal auxiliaries, as well as microwave transmitter and receiver equipment. Other buildings in the complex contain administrative offices, the station's television training school and its well-stocked library and archives.

WDR and the ARD: Versatile network programming

Westdeutscher Rundfunk was established in 1950 to provide first radio and then television programming to the Nordrhein-Westfalen (Northern Rhine/Westphalia) sector of the Federal Republic of Germany, that area historically called the "Rhineland." Although the Cologne facility functions as the main production center of the ARD, when taken as an entity, WDR is a substantial network itself, for Wallrafplatz is the nucleus of a system that consists of 7 medium-wave and 38 VHF radio transmitters complemented by 22 VHF and UHF television transmitters in a total of 20 cities. The television transmitters are supplemented by 186 low-power rebroadcast units (translators and repeaters) to provide television to rural areas not covered by the direct broadcasts. The transmitters vary in ERP from a 500-watt unit in Bonn, to the 500-kilowatt (800-KW at night) installation in Münster-Baum. WDR also maintains production studios in Bonn and in Düsseldorf.

The parent ARD organization employs approximately 190 VHF transmitters to cover the Republic. Microwave links, owned by the Deutsches Bundespost (German Federal Post Office Dept.), are used to relay signals from one transmitter to another and TV frequency converters are used for signal regeneration. In addition to being in the ARD net, WDR coordinates with ZDF (Zweites Deutsches Fernsehen) to provide UHF programming to areas on the fringe of, or outside of, the coverage of the VHF transmitters.

As with the other ARD member stations, WDR broadcasts three radio programs and three television programs. In addition they air a joint program for foreign laborers. The radio programs use medium-wave and VHF frequencies, while the television channels are operated in accordance with CCIR System B, 625 lines, 50 Hz, PAL. They use frequency bands I and III, channels 2 to 12 for VHF; and bands IV and V, channels 21 to 60, for UHF.

The three television channels provide a wide variety of programming and are popularly called the "First" program, the "Second" program and the "Third" program. The "First" program is officially called the "Deutsches Fernsehen" ("German Television") and is telecast on both VHF and UHF. Shows on these channels are produced by each of the ARD stations and at a given time are transmitted over the entire network, except during a special regional time slot between 6 and 8 P.M., when each station transmits material originating in its own studios. The "First" program is aimed at the broadest segment of the audience and as such it is the basic entertainment offering. Even so, the offering

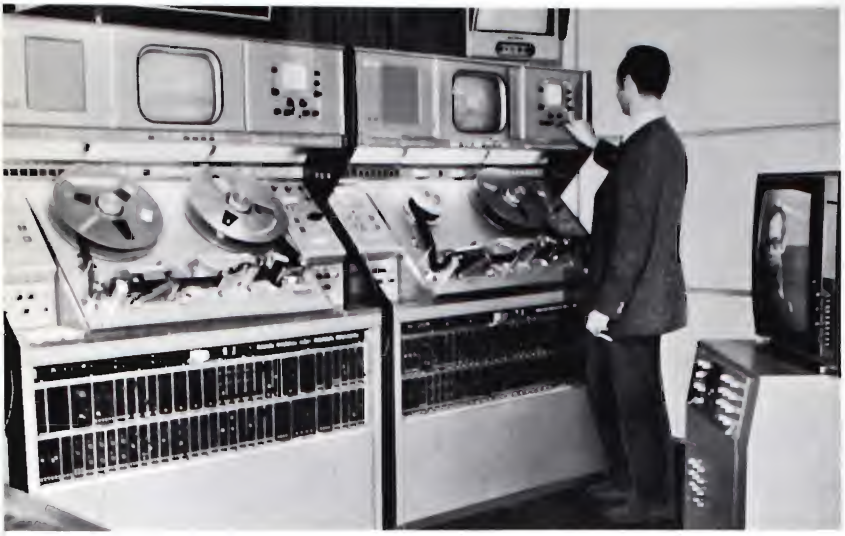
(*Arbeitsgemeinschaft der öffentlichrechtlichen Rundfunkanstalten der Bundesrepublik Deutschland)

may be highly cultural in flavor—an original or classical drama, sophisticated comedy, or ballet. Individual selections may be presented in several episodes, over a period of several days. Because its program content is intended to appeal to the majority of viewers, all commercials are scheduled during its airtime—but none are permitted on Sunday. When commercials are scheduled, they are normally grouped together into "blocks" and run consecutively at the 1800 and 2100 time periods. The "First" program may be viewed on Sundays between 1000 to 2200; Monday through Thursday from 1540 to 1705 and 2000 to 2130; Friday from 1900 to 2230; and Saturday from 1355 to 1705 and from 1900 to 2300.

The "Second" Television Program is prepared for the entire Federal Republic by the television broadcast corporation Zweites Deutsches Fernsehen (ZDF) in Mainz. Separate transmitters are used, which are installed and operated by the Bundespost. The ZDF provides a variety of fare by producing in its own studios in Mainz and by selecting from the material telecast by the ARD stations. One particularly important public service of the ZDF is its daily broadcasts in five languages that are directed to the multi-lingual labor force in the Ruhr Valley.

The "Third" Television Program is prepared by each ARD station for broadcast exclusively to its own operating region; however, the transmitters for these frequencies are also installed and operated by the Bundespost. These shows feature topics of metropolitan and regional interest, primarily of cultural, athletic or social import with supporting news events. This program is shown weekly from 1705 to 1900 and on Saturdays from 1330 to 1355 and 1730 to 1900.

Imposing architecture of WDR Production Center adds new dimension to Cologne's skyline.



WDR relies on TR-70 series video tape recorders for production of full-fidelity color programs.

TR-70's take to the road in WDR OB unit to telecast/record a wide range of outdoor and remote events.

WDR: The ARD's main production center

Each of the ARD stations supplies the network feed at pre-determined periods. However, since WDR has the most comprehensive production accommodations and expertise, it supplies more than one-fourth of the ARD telecasts, be they live, film or video tape, from the Wallrafplatz studios.

Once inside these buildings, you are again deeply impressed, this time by the bustling activity, the professional performance of all staff, and the real, easily apparent enthusiasm they have. It seems that everyone associated with the station's business, from administrative offices to the maintenance shop, from entertainers to producers, from video engineers to the drivers of the OB vans, are all delighted to be working in television.

Since WDR is a major production center, it includes complete studio facilities for the presentation and production of live, film and video tape programs. Studios "A" and "B" are where the main dramatic and variety shows are originated. They are identical in size, each being approximately 23 m. by 32 m. providing 736 $m.^2$ meters of floor space. With their ceiling heights of 12.5 m. they can handle even the most lavishly staged productions. All ancillary services, such as lighting, audio systems, air conditioning, are completely up-to-date and provide both the maximum capability and the reserve capacity required to keep pace with the studios' busy production schedules.

The 306 $m.^2$ Studio "C" is unique in that it is the primary locale for the production of regional shows aimed at the various nationalities that work in the heavily industrial "Rhineland." These include the "International Morning Panel," a conclave of experts who comment on the news from Germany, Italy, France, England and the United States. Then there is the "Gastarbeiter," the show aimed specifically at each of the "Working Class" ethnic groups—in its mother tongue—Spanish, Italian, Greek or Turkish. The "Gastarbeiter" programming takes the form of "folk" dramas and musicals, plus news and current events hosted by a female announcer. These attractive young ladies are all natives of the country whose language they broadcast in and all identify readily with their audience. Needless to say, they are very popular and have extremely loyal followings.

Studio "D" is the smallest camera studio at WDR, having some 108 $m.^2$ of floor space, and, consequently, it functions as the announce and interview studio for daily news and topical comment concerning the Cologne metropolitan area and the Republic. This studio is interesting from an operational viewpoint, because WDR has innovated complete remote control of the camera. Only the announcer and necessary aides are in the studio during the telecast—all camera functions are the responsibility of the remote video camera operator in the adjacent control room.

Besides live and video tape presentations, WDR produces most of its own film pro-

Two WDR Outside Broadcast units. On the left a 3-camera bus, on the right a special, VTR van.

gramming in studios "S," "T," "U" and "V," which range in size from the 95 meters square of the identical first two, to the 50 meters square of the last two. Complete facilities are available in these studios for the production of color and black and white film, for airing on the "First" and "Third" programs.

As far as state-of-the-art trends are concerned, WDR is rapidly converting to full color operation. Color broadcasts commenced in the Autumn of 1967 with the acquisition of a color telecine chain and ever since, they have steadily acquired the complementary sub-systems necessary for color production and transmission. At the present time they have fifteen lead-oxide tube color cameras in their studios, all of which are four-tube units that have been modified in their laboratories to meet their operating standards. In addition, they have two complete color OB vans, one with four new three-tube color cameras and the other with three cameras of the same type. All studio and OB cameras are equipped with 10:1 zoom lenses. They are used on pedestals or motorized dollies in the studios and trailer-attached "cherry pickers" for outside broadcasts. Aoproximately 22, 12 and 15 centimeter image orthicon monochrome cameras are used in the studios, while the remote vans employ a total of eight.

The film/sound studios are fully equipped for production of both 35-mm and 16-mm sound films and 35-mm slides. Also installed are facilities for producing sound/over and sound/sync programs.

All video tape and telecine equipment is installed in a seven-room suite on the third level of the main building—as a note of interest, the first four levels of this structure are subterranean. Three of the rooms contain complete telecine chains equipped for 35-, 16- and 8-mm films, transparent slides and opaque artwork. Four rooms house the video tape facilities, which are combined with 16- and 35-mm projectors to provide sound-on-tape facilities for multi-lingual presentation.

Twenty-six RCA video tape machines are used to produce all of the tapes made by WDR. These VTR's run the range from the first of ten TR-22's, which was delivered in January 1963, to their sixteen TR-70 types. The RCA recorders are used for both the internal ARD and ZDF programs and are additionally employed to make the five-minute special news tape that WDR submits to the Eurovision and Intravision networks every day.

Since the introduction of color television in West Germany approximately four years ago, shows electronically pre-recorded on video tape have attained an ever increasing role in WDR's program scheduling plans and are beginning to challenge filmed productions as the best medium for the presentation of previously recorded studio and/or outdoor events. This greater reliance on electronic recording compels WDR to constantly use its VTR's, from the early morning hours until late at night, to the extent that they operate on practically a 24-hour basis. Thus, they must even more heavily tax their combined production facilities, which amplifies the need for all units to perform with maximum operational quality and reliability. These demands then become especial prerequisites when video tape equipment is sourced.

One manner in which they are attempting to cope with the tremendous new production requirements is the acceleration of the volume of shows produced. They hope to accomplish this goal by decreasing the time required to complete individual programs and by making their production more economical.

They expect to accrue substantial realization of these objectives from a new RCA Time Code Editing System (TCE) that has been commissioned recently. This unique editing system is designed to simplify and expedite the preparation of video taped programs, provide better utilization of personnel and studio facilities and improve the precision and quality of video tape programs. The TCE represents a completely new technique for WDR, because prior to its installation, they relied on obsolescent mechanical splicing devices—essentially the old razor blade method. Their future plans call for the purchase of a second time code editor, to deliver additional editing creativity and production economy.

The second level of the building contains all switching, control and auxiliary equipment, for each of the production studios Here also are the control positions for the studio lighting boards and dimmers plus the audio consoles for the sound portion of each program. The master control room is connected to the main telephone center of the Bundesposts in Cologne via wire lines so that it can control the transmitters servicing Cologne and relay the broadcasts via microwave links to the other transmitter in the net. Included in the terminal equipment are the units for the S-T-L radio relay links that are used for remote pick-ups in the Cologne sector.

WDR has in-house facilities for the fabrication of everything associated with its productions—all sets, props, backdrops, as well as wardrobes, cosmetics, lighting gear—everything. No matter how lavish or complicated the spectacle, WDR has the expertise and the resources to assure its presentation to the highest standards.

Outside broadcast vans are used a great deal to add the impact of current events to viewers. They cover all the major political and social gatherings in Western Germany and also telecast important cultural and athletic items, from places such as the Apollo Theater in Düsseldorf, the Red/White Tennis Hall in Cologne/Mungersdorf and the civic center in Rath-Heumar. Indeed, the big Mercedes vans with the WDR logo are a familiar sight to the people of Westfalen.

WDR: Planning for the future

Westdeutscher Rundfunk has many plans for the future, as far as expansion of facilities and broadcasting services is concerned. At the present time, Studio "B" is used for the re-broadcast of programs received from the United States via the "Early Bird" satellite, and the Goonhilly Downs earth station in Great Britain. From the ground station, the signals are relayed to the BBC standards converter at White City for transition from NTSC to PAL for Federal and Eurovision distribution and from NTSC to SECAM for the Intravision network serving Eastern Europe and the Soviet Union.

Again for the future, WDR is heavily engaged in an automation study to develop the equipment requisites and operational procedures necessary for the employment of the more efficient and cost-effective automation techniques.

As regards color programming, WDR is continuing with its plan to be completely converted for total color operation by 1975, on all four program formats. This will entail the purchase of additional color cameras, many more video tape machines, including cartridge-design units, and telecine chains, as well. They also contemplate expansion of studio and production facilities, so that they can continue to produce the bulk of their programs.

Wallrafplatz has been the scene of many history-making events since the first Roman legions built their permanent barracks in 50 B.C., but scarcely any as impressive as the accomplishments of Westdeutscher Rundfunk in the last twenty years. ■

Radio e TV
Difusora
Portoalegrense S.A.

Why did a religious order organize a commercial TV station?

Stylishly modern station buildings overlooks metropolitan Porto Alegre

The story of Radio e TV Difusora Portoalegrense S.A. is an excellent example of natural progression in the use of mass communications media. For the Capuchin Order has advanced up the communications ladder in a series of well-planned steps. We started more than fifty years ago with "Correio Riograndense," a weekly newspaper, that for many years was the only medium for dispensation of news and information to its 50,000 subscribers, many of them residing in remote communities of the state. Then came a network of medium-wave radio stations and now we have a modern, fully-equipped, television station. With the aid of today's electronics, our Order has substantially increased its ability to provide additional social and cultural benefits to the people of the State of Rio Grande do Sul, the southernmost portion of Brazil.

The concept of using these vehicles for the promotion of human values is in full accord with the teachings of the Catholic Church, as expressed recently in a statement by Pope Paul VI when he said: "Catholic social communication media have a two-fold function, that of entering into competition with other media, termed neutral and enjoying public preference, and that of not only informing its listeners but also training them and getting them accustomed to judging things and events according to Christian conscience."

Why a commercial station?

Our reasons for operating on a commercial basis include the psychological, the competitive and the profitable. To be specific, years of experience with Radio Difusora and radio stations in the interior, plus observations of stations operated by universities and other institutions, taught us that the purely "cultural" or "religious" radio (or TV) station seldom enjoys popular prestige and often has little audience. It seems that as far as the airwaves are concerned, the general public tends to avoid most of what it considers to be "non-entertainment" fare, while if the message is enhanced with humorous material, or the drama of "human" interest, it is much more quickly accepted and remembered. Thus, we determined that when the listening or viewing "household" turns on the radio or TV set, it wants most of all to be entertained and informed. Therefore, the secret is to add these ingredients to the station's format so that in the long run it can successfully relate its primary philosophy.

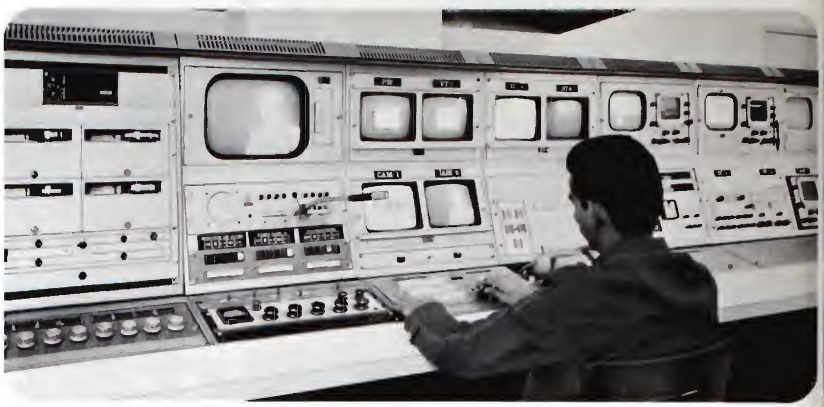
But to assume this well-rounded image, the broadcaster must create and present a wide variety of programs, often from different locales. He has to employ many talented people and surround them with all sorts of sets and props. Finally, he needs the equipment to produce the shows and deliver them to the audience, plus the personnel to staff the station, ensure quality programs and maintain the operation. In order for us to accomplish these things we realized that much additional capital would be required, far beyond what we obtained from donations and endowments. To cope with this dilemma, we evaluated various schemes, but we rapidly concluded that the best method for obtaining this supplementary operating revenue was to encourage local business and industry to advertise on our station. Thus, Radio e TV Difusora became a commercial entity. A side benefit of running paid announcements is that while the audience still may easily recognize specific programs because of their prominent religious or social import, it no longer labels the whole station "religious" or "cultural."

Evolution of Radio e TV Difusora

Radio e TV Difusora had its origin almost two decades ago, when our Order of Capuchin Fathers, confronted with the urgent need for teaching Evangelism in the remote regions of Southern Brazil, concluded that radio programming offered an ideal solution. Therefore, we purchased a few medium-wave transmitters and slowly began the formation of a network which now consists of seven radio stations covering the State of Rio Grande do Sul.

In 1956, we purchased Radio Difusora Portoalegrense from Diaros Associados in order to have a master broadcast station in Porto Alegre, the state capital. Soon after its acquisition, we increased its transmitter output to 30 KW and commenced the presentation of educational and Evangelistic programs. The fact that we were competing with thirteen commercial stations in the city made it necessary for us to obtain commercial advertising to absorb operating expenses.

Fr. Cyrillo Matiello, responsible for the station's operation and performance and the author of this article.



In 1960, we entertained thoughts of obtaining a license for a TV station in Porto Alegre. The government made this a reality in 1961, by authorizing Radio Difusora Portoalegrense to begin broadcasting on TV Channel 10. However, since no one in the Order had any experience in the field of television and because economic and political factors were unfavorable, our plans for implementing a TV facility remained in a formative stage.

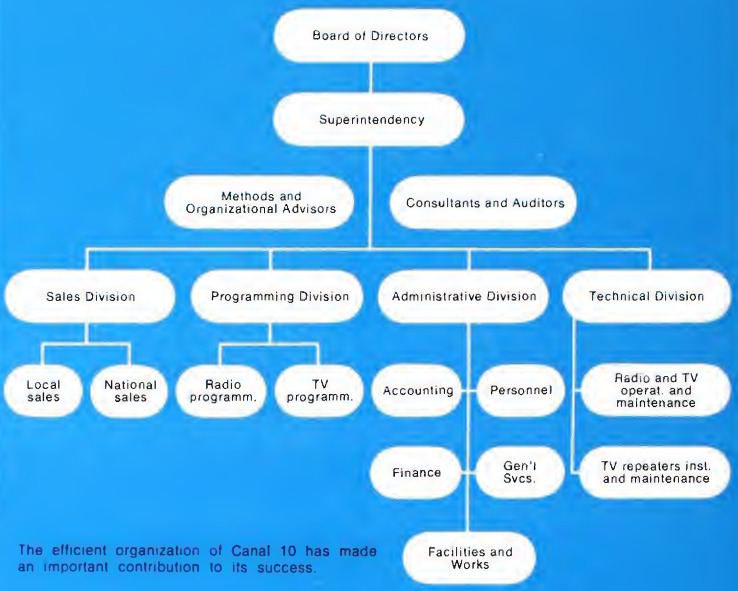
To prepare for the future, though, I was sent to the United States to attend electronics and television courses at RCA Institutes on a full schoiarship furnished by RCA. My return to Porto Alegre at the end of 1964 coincided with improved political conditions that permitted us to commence the start of a television station. Since the Capuchin Fathers did not have sufficient financial means, it was decided to transform Radio Difusora Portoalegrense Ltd., into a stock corporation. Financing was arranged so that 70% of the capital was provided by the assets of Radio Difusora and the group of Capuchin Fathers who had been working at the radio station without remuneration. The remaining 30% was raised through the sale of shares, with 5,000 shareholders participating. Besides providing the necessary extra capital, the stock offer afforded an opportunity, within the spirit of the Vatican Council, for the Catholics of Southern Brazil to sponsor a Christian-oriented TV station.

The new firm, "Radio e TV Difusora Portoalegrense S.A.," was established and inaugurated on October 10, 1969. The Capuchin Fathers most involved with the creation of the station are Friars Jose Pagno, its Director and President; Antonio Guizardi and Osebio Borghetti, Executive Directors; and myself, in the capacity of Technical Director.

Administrative organization

After financing was accomplished, our first administrative step was to have Messrs. Walmor Bergesch and Jose Salimen, Jr., two individuals with wide knowledge and experience in TV operations, assume responsibility for the company's business activities. Then, we staffed key positions in other departments, similarly with responsible persons having extensive backgrounds in TV. Specific criteria were used

CHART I



The efficient organization of Canal 10 has made an important contribution to its success.

CHART II

1970 Percentage of Audience

	TV Difusora	Second Channel	Third Channel
Overall Yearly Averages	46.6	38.4	15.0
Qualified Audience (Economic Classes A and B)	22.6	19.6	21.8
Qualified Audience (Economic Classes C and D)	27.0	21.8	7.3
100 Largest-Audience Programs	57.0	40.0	3.0

The real accomplishments of Radio e TV Difusora Portoalegrense S.A. are reflected by their impact on the viewers.

TV Difusora's master control. It was the first and is currently the only station in South America built to handle color broadcasts.

to help us select the best available people: sixty percent came from competing stations, while the balance are products of our in-house training programs. We took especial pains to attract young people, because we wanted to add the open-mindedness and boundless enthusiasm of youth. The adjacent chart shows how the company is organized, with respect to the major operating divisions. To supplement our management, we engaged on a "permanent consultant basis," the services of two companies specializing in business accounting, administrative and finance.

Programming

Approximately 15% of our schedule is strictly religious and cultural, because we want our daily bill of fare to convey a positive Christian message with the emphasis on human values. Our educational responsibilities have been dramatically assisted by one particular show called the "General High-School Course." We presented this feature in cooperation with the State Department of Education to approximately 30,000 registered students. Countless others in the general public were able to take advantage of the hundreds of TV sets we located in the city and its suburbs. The "GH-SC" offered a full high school curriculum, including final exams and the award of a diploma upon successful completion.

Seventy percent of our programming is of national origin, either produced in our studios or acquired from other production sources in Rio de Janeiro and Sao Paulo. American feature films comprise the remaining thirty percent.

Audience

We are proud to say that from the very beginning and to date, we have clearly maintained audience leadership among the three TV stations in Porto Alegre. The extent of our popularity is shown very graphically in the charts.

All of the data given here are from the official records of the IBOPE (Brazilian Institute of Public Opinion and Statistics), which conducts coincidental-call surveys. During the course of 1970, the IBOPE performed a study of "television audience habits" which showed that 84% of the general viewers rated TV Difusora "Good"; 93% indicated that they are "satisfied" with Channel 10's programming; and 96% said "Yes" when asked if Channel 10's ideas met their expectations.

Economic aspects of the company

TV Difusora is not only achieving its mission of offering the public honest and wholesome entertainment combined with culture and religion, but also it has shown reasonable profits during the first year of operation. We feel that this can be credited to our use of modern, efficient, business practices, plus the capability of our administrative staff. Recapitulation of the year's performance reveals that our ratio of profits to operating expenses is excellent for a television station in Brazil.

A network of independent broadcasters (REI)

When TV Difusora commenced telecasting, there were only two TV networks in Brazil: Associados and Rede Globo de Televisao. At TV Difusora's initiative, a new network was established by a group of independent stations to facilitate program interchange and purchase. Today, 12 broadcasters are members of the REI, including TV Record in Sao Paulo, TV Difusora, and TV Rio in Rio de Janeiro. The last station named is being reorganized by us, as we recently assumed responsibility for its operation. Our initial administrative decision will be to equip it with new equipment purchased from RCA.

TV Difusora looks to the future

We have virtually completed the installation of 12 new repeater stations in the outlands of Rio Grande do Sul, using UHF channels for the point-to-point links and VHF channels for local distribution. The central station's television picture is now transmitted with high-quality results over a distance in excess of 400 Km, extending its coverage to 5,500,000 inhabitants. Another network of repeater stations is being constructed to connect an additional 17 cities in the back-country. This system is scheduled for completion toward the end of next year. A joint financing plan was developed to permit installation of this new service—40% of the required funds are derived from the communities that are benefited while the balance of 60% is supplied by TV Difusora.

To secure additional monies, a commercial production center was built for agencies and sponsors—a pioneering experiment for Brazil. Now, whenever our studio is not engaged in a telecast, we can produce video-taped commercials that we sell to advertising agencies for use on other Brazilian stations.

Plans are under development for the expansion of this "Teleproduction Center" to provide it with additional capability. Soon, we will be able to create cultural and entertainment programs, as well as programs of Christian teaching, which may be sold to the other network affiliates.

THIS IS RAI

Administration

The national broadcasting agency of Italy is a joint-stock company with registered offices in 14, Viale Mazzini, Rome. Its stock is held by two financial public corporations and private shareholders. The company was founded in Rome on August 27, 1924 under the name URI—Unione Radiofonica Italiana. After a series of reorganizations and amalgamations its name was changed to RAI—Radiotelevisione Italiana on April 10, 1954.

The purpose of RAI is to provide the Italian public with radio and television broadcasts and wired radio programs on an exclusive basis and to operate a radiophoto service without exclusive rights. The Italian Posts and Telecommunications Act of 1936 ruled that the above services belong to the State, which may concede them. By an agreement made on January 26, 1952, the Ministry of Posts and Telegraphs (PTT) granted RAI a license to manage these until December 15, 1972, at which time the license will be reviewed.

RAI derives its income principally from radio and combined (TV plus radio) licenses, and from radio and television advertising. The broadcast license fees and the percentage which the Company accrues are fixed by the State. Advertising revenues are limited by Federal law and by conditions that RAI itself imposes with regard to both time and fees, so that a uniform distribution of the national advertising budget between radio, television and other media is maintained. Other sources of income derive from the refund of expense incurred by the company in the performance of tasks for the State, such as shortwave external broadcasts and broadcasts in German for the Alto Adige region.

Organization

Organizationally, RAI is divided into two levels, central and peripheral, and into three large sectors: Programmes, Technical and Administration.

The central level consists of 9 Central Departments. The Central Departments for radio programs, TV entertainment, TV cultural programs and news are responsible for the development and coordination of all entertainment, cultural and educational aspects of those media. The technical Central Department plans and operates the radio and TV transmitting networks and all other equipment associated with the production, recording and transmission of programs. The Administration Central Department, and some offices of the technical Central Department including the Technical Research Laboratory are located in Turin, while all other agencies are in Rome.

The Production Centers and the Regional Offices are at the peripheral level. They operate in the three sectors of the Company's activity to produce radio and television broadcasts—formulated at the central level—for the national networks (the Offices generally deal only with outside broadcasts and news services). They supervise all aspects of local programs.

RAI has five Production Centers: Separate ones for radio/television in Rome and combined ones for radio and television in Milan, Turin and Naples. The Monza Control Center in the Milan area monitors all transmitter functions in the network including any interference with or from foreign stations.

There are 14 Regional Offices, one in each region without a Production Center, located in the towns of: Ancona, Bari, Bologna, Bolzano, Cagliari, Cosenza, Florence, Genoa, Palermo, Perugia, Pescara, Potenza, Trieste and Venice.

Radio programs

Radio broadcasts total approximately 45,000 hours per year. By category, 17,500 are broadcast on the national networks—16,500 originate locally and 11,000 are beamed to foreign countries.

Programs on the national networks

RAI distributes three national programs, the National Programme, the Second Programme and the Third Programme on both AM and FM. In character, they complement each other, since listeners are offered a choice of entertainment and cultural material, informative discussions of current events, sports and specials, such as satellite launchings, foreign elections, United Nations meetings. Classical music is offered during virtually a third of the total airtime. Selections are obtained from the annual public season of RAI's permanent symphony orchestras in Turin, Milan, Rome and Naples, from concerts by other Italian and foreign orchestral groups and from the annual opera season "Naples Musical Autumn."

Music in a lighter vein is almost the exclusive province of the National and Second networks. Original productions are performed by two permanent orchestras, based in Rome and Milan. However, most of the programs are from records. Drama is available mainly on the National and Third Programmes. Both legitimate theater and plays written especially for radio are performed. Serials adapted from works of literature are more often broadcast on the Second. Cultural programmes are prominent on the Third, which schedules many of them in series form so that in-depth coverage of the specific subject can be obtained. The National and the Second channels offer features on a slightly lower plane to satisfy a more general audience.

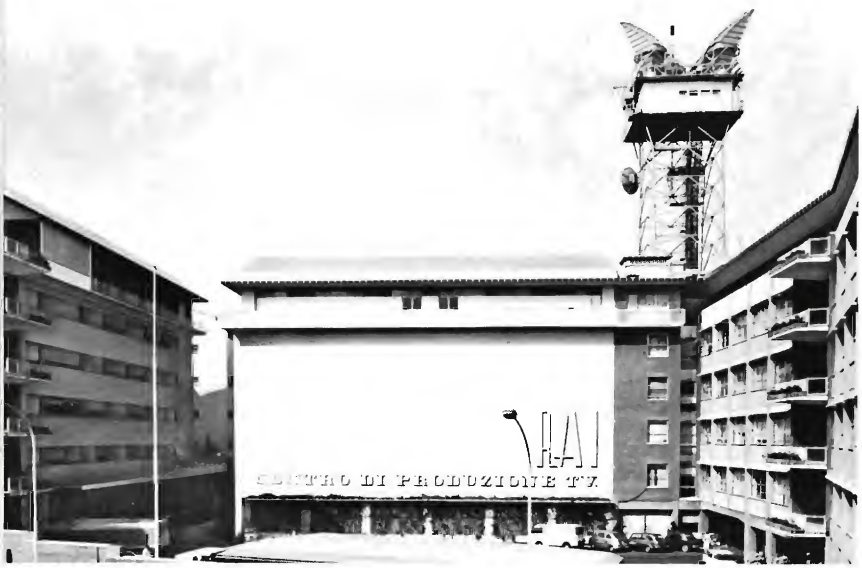
In addition, RAI presents religious broadcasts, programs for children and for schools and aircasts dedicated to special audiences (women, young people, invalids, the Armed Forces and tourists).

Nine daily news bulletins on the National and fifteen on the Second Programme provide the latest information concerning home and abroad. The Third channel presents a news program also, but with greater analysis and editorial.

Commentaries, current affairs programs and debates complete the information relevant to national and international events, from politics and economics to art and culture. Most of this fare is available on the National Programme, particularly politically-oriented shows; the most popular of these incorporate debates and include the "Brains' Trust," "Political Gallery" and "Electoral Gallery" (the last two being broadcast in conjunction with TV).

RAI's massive production studios are the scene of a variety of lavish creations.

The striking architecture of the main complex in Rome houses more than 20 VTR's.



Sports Broadcasts are transmitted on both the National and the Second Networks. There are a number of weekly series, such as "All Soccer Minute by Minute," "Sports Preview," "Sunday Sport" and "Wheels and Motors," as well as direct commentaries and "specials."

Local programs

Many local programs are scheduled in order to satisfy the civic and cultural needs of each region. They are broadcast daily from the Centers and from the Regional Offices, usually during breaks in the Second Programme. A few broadcasts are intended for foreign-language speaking minorities inside the Italian borders.

External services

The RAI external services are emitted on short and medium waves, in Italian for Italian residents abroad and in 25 foreign languages.

The shortwave programs offer both cultural and entertainment material for a wide range of listeners: There is a correspondence series for emigrants to Italy, a special program directed to men at sea and a children's series. Periodic sports reports in Italian are interwoven with news bulletins and recorded commentaries taken from the national services.

The medium wave fare includes several specialized language programs, including the "news for the Mediterranean Basin," in Italian and Arabic, "Venezia Giulia Hour," for Italians in Istria, and "Nocturne from Italy" a music and news offering every night from 11:15 P.M. until 6:25 A.M., in Italian, French, English and German. "Nocturne from Italy," "News for the Mediterranean Basin" and the three national radio programs are also available on the shortwave frequencies.

Wired rediffusion and telephone news

The wired rediffusion service is available in the 12 most populous cities on a subscription basis. It permits the high fidelity reception of the three national radio programs plus two other programs, one of classical music and one of light music via a home receiver styled very much like an ordinary radio. The signal is wired along standard telephone cables, so that radio or "combined" license holders having a telephone can subscribe to the service.

An additional telephone news service can be dialed on any public or private telephone. It operates in 36 cities and consists of a news bulletin of 2.5 minutes duration, specially edited by RAI and updated every two hours.

Television programs

Television broadcasts total over 5,700 hours per year, with practically all of them being on the national networks.

Programs on the national networks

There are two nationwide television programs, the National Programme and the Second Programme. Three-quarters of the total output are broadcast on the National Programme, which is aired most of the day with intermission in the afternoon. The Second Programme functions only during the late afternoon and evening. Neither of the two programs has an established character. Schedules are devised to offer a choice between different kinds of programs whenever the networks are on simultaneously.

Much effort is expended to present drama on TV. Original classical and modern theatre, plays and serials written especially for television and material adapted from works of literature are employed to cater to the variety of public tastes.

Dramatic works produced in RAI's own studios are augmented by selected commercial films, which may be of domestic origin or foreign-made. In order to provide viewers with sufficient material to evaluate the movie and individual actors, films are grouped together to illustrate significant trends, directors, and performers. Each film series is usually introduced by a critic or one of the producers, who delivers an explanation of the films' intent. Entertainment shows normally have a variety appearance with lavish sets, intricate choreography and original music scores.

Substantial broadcast time is allocated to contemporary cultural programs, such as "The Landing Place," for literature and art; "Cinema and Theatre News," for enter-

One of a fleet of OB vans that bring much of Europe's activity back to Italy.

This team of TR-70's are installed in one of the valuable outside Broadcast units.

tainment; and "Bookmark," for books. "Almanac" and "Horizons of Science and Technology," concern history and science, "Write to Us!!!!" and "Living Together" involve family and social life. Current political, social, historical and scientific issues are covered by a series of in-depth documentaries and discussion shows: "Health Under Investigation," "Encyclopedia of the Sea" and "Discovering Africa." Many of these historical and cultural topics are presented dramatically. An example is the series "Great Italians" which presents the biographies of major Italian historical figures and "Inquiry Theatre" which presents events and characters of recent history.

"Children's TV" for sub-teens is telecast one hour each day and includes cartoons, puppet shows, films and serials, general knowledge series, entertainment and quiz programs. For younger children there is a series entitled "Play School," designed to foster the children's acquaintance with the world around them.

RAI began direct educational, or "school broadcasts" in November 1958 with the "School by TV" courses, beamed at first to vocational training schools and later, when the educational system was reformed, to Italy's new Unified Junior High Schools. Courses were scheduled through the 1966-67 school year, to compensate for regular classes in those areas without schools, with insufficient teachers or with limited transportation. Since these deficiencies have been corrected, TV is now used to broaden and enrich learning in vocational schools. Experimental broadcasts to High Schools were begun in 1966-67. The results obtained were so satisfying, that these broadcasts are being continued and will be extended to cover Junior High Schools.

Educational broadcasts for illiterate and semi-literate adults were begun in 1960 with the course entitled "It's Never Too Late." "Knowledge," a new series, was begun during the first semester of 1967. These broadcasts attempt to educate adults in physics, languages, law, child welfare, to equip them better for modern life.
Five editions of the news are broadcast daily, four on the National Programme, at 1:30 P.M., 5:30 P.M., 8:30 P.M. and at the close of programming which is generally

A TR-70 helps the Milan production center maintain quality video tape programming.

The Rome color training laboratory began with an RCA TK-41 camera.

around 11 P.M. The Second Programme carries a news report at 9 P.M. Approximately ten percent of the total broadcast time is alloted to news presentations, comprised of filmed or video taped reports, live narrations, direct reports from foreign correspondents and discussions by journalists of current events in Italy and abroad. Regional topics are related in "Italian News" which is presented every day on the First Programme, before the 8:30 news. RAI uses commentaries in order to illustrate major political, social and cultural events in a more lively and informative manner. In addition, headline items are dealt with in detail by "Current Affairs Reports" which are prepared immediately after events occur. Often, talks concerning these matters are regularly aired under a number of headings, such as "Today in Parliament," "News from the Parties," "Labour and Economics News," "Front Page" and "TV-7," the last being a topical weekly with a large following. RAI has also determined that debates are an excellent means of delving deeply and critically into current affairs. Consequently, they present two regularly scheduled series in this format: "Political Gallery" and, during election campaigns, "Election Gallery." Both of them are regulated by the Parliamentary Committee for the Supervising of Broadcasting. The programs consist of debates, individual talks, interviews and press conferences. Members of Parliament, political party leaders and political scientists participate, as well as journalists from partisan and non-partisan newspapers. Various current issues are debated under such titles as "Topical Debates" and "Opinions Compared," whereas "Encounters" interviews acquaint the public with luminaries from all walks of life.

Sports presentations are grouped into three basic formats: news bulletins, which furnish immediate results of contests; commentaries, which relate events in detail; and regularly scheduled discussions such as "Sprint" and "Sunday Sport," in which events and personalities are analyzed and projected.

On important occasions, during trade fairs, exhibitions or celebrations, RAI beams TV programs into their venue in order to promote the event and provide attendees with local news and entertainment.

Installations and equipment

Radio

The structure of RAI's medium-wave, amplitude modulation radio network is based on the three exclusive and eight shared frequencies allocated to Italy by the 1948 Copenhagen Conference. The plan authorized by the Conference allows RAI to use any number of transmitters on one of the two common international frequencies providing their output power is limited to 2 kW or less. The High power transmitters of Rome 2 and Milan 1 operate on 845 and 899 kHz, respectively, two of the three exclusive frequencies. The shared wavelengths, in agreement with the various countries involved, are assigned to the low and medium power transmitters situated in the more densely populated areas of the country. Thus, despite the somewhat unfavorable geography of Italy for medium-wave propagation, during the daylight hours, the National and the Second Programmes may be received clearly by virtually 96% and 92% of the population, respectively. Unfortunately, the Third Programme can only be received in 23 urban areas, amounting to some 30% of the population.

However, over a period of time, these results were impaired by violations of the Copenhagen edicts by some countries and by several "Pirate" stations. To compensate for signal losses due to co-channel interference and topography within Italy and especially to reach all of Western Europe, where many Italians work, RAI strengthened its medium-wave network and instituted sound broadcasts on the VHF-FM mode. Approximately 98% of the population is reached by the FM stations, which proliferated at the same rate as the VHF-TV stations, since the transmitters for the two services are situated on the same sites. Normally, each radio station location consists of three transmitters, one for each of the national programs. A number of stations have a fourth transmitter which is used for separate language broadcasts or as a standby for emergency use for regular program units. The sites employ this additional transmitter to provide stereophonic broadcasts on an experimental basis.

Short-wave transmitters installed at the Prato Smeraldo Short-Wave Centre and at the Caltanissetta medium-wave station provide international broadcasting services. The former site airs programs especially produced for foreign countries and beams the Third Programme to the Mediterranean area. Caltanisssetta broadcasts the National and the Second Programmes to Mediterranean countries.

The relay network is divided into distribution and subsidiary sections to link the Rome Radio Production Centre to all the transmitters and to connect all the other Production Centres and Regional Offices to the Rome Centre. The complex distribution section is primarily a microwave system but many of the FM transmitters are fed by sister stations on a line-of-sight basis.

The Production Centres, Regional Offices and the manned transmitting stations are interconnected by a telephone network that terminates at the Rome automatic clearing and switching station. This permits the rapid transmission of news to the Central Editing Offices of the Radio and TV News Services.

The RAI radio network is huge; with more than 1,800 transmitters: 128 medium-wave; 10 short wave; 1,669 VHF-FM. It contains over 123 studios, equipped with more than 560 fixed tape recorders and 60 plus disc records. For outside broadcasts RAI has many OB vans and approximately 580 portable tape recorders. Many vans contain FM transmitting equipment for studio-to-transmitter link applications.

Television

Television broadcasting is technically difficult in Italy, due to the country's geography and uneven population distribution. Therefore, they have opted for a few high-power stations to serve the metropolitan areas situated on level terrain and many medium-to-low power stations for the numerous communities located in hilly country. The same program is usually transmitted simultaneously, the high- and medium-power stations being connected by radio links, while the low-power stations are repeaters fed by the main stations or by other repeaters.

The network for the National Programme officially began to operate 3rd January 1954, on 9 VHF channels, designated A through H_1 in the CCIR bands I, II and III. These frequencies permit 98% of the population to receive the National Programme. The Second Programme network, inaugurated on November 4, 1961, uses 16 UHF channels: 14, numbered from 21 to 34, in band IV, and 2, denoted 35 and 37, in band V. Ninety-one percent of the population can receive this program. Both programs are broadcast on 625 lines, 50 Hz. The TV relay network is divided into distribution sections which function in the same manner as for radio broadcasting. It is mainly composed of frequency modulation radio links; however, where repeaters are used they receive and retransmit the signal broadcast by the transmitter within whose range they are situated. This net also carries the audio portion of the television signal, the service channel between the remote-control pulses used for automatic operation of some transmitting installations and the relay system.

In scope, the RAI television network rivals its radio network in emission and production capability. The National Programme has 37 VHF transmitters with 752 repeaters, while the Second Programme uses 39 UHF transmitters with 752 repeaters. Production facilities comprise 27 studios in 4 Production Centres: 13 studios with 59 cameras in Rome, 7 studios and 34 cameras in Milan, 3 studios with 13 cameras in Turin and 3 studios with 10 cameras in Naples, plus one studio with 3 cameras in the Florence regional office. Studio equipment includes 38 video tape recorders, 40 telecine chains and 6 kinescope recorders. For outside broadcasts, RAI has 124 vans, 24 equipped with TV cameras, 8 with motion picture cameras, 2 for video taping, 2 with a telecine chain and 2 with film processing and editing facilities. The remaining vehicles house supporting auxiliaries.

Color television

The Government having not yet authorized regular color television broadcasts, the activity of RAI in this field is presently intended only for training of its staff, for providing color coverage of important events for foreign broadcasters and for radiating test pictures for the home set manufacturers. The RAI equipment presently works in the PAL standard; however, the Government is going to make a choice between PAL and SECAM, the latter being

used in France, USSR and most of Eastern European countries.

RAI began experimental color television work, in close cooperation with other members of the European Broadcasting Union, in 1962, with two RCA TK-41 cameras, which are still used for training purposes in Rome. Present color facilities include three large studios (one in Rome, one in Milan, one in Turin), one news studio in Rome, three OB vans, equipped with a total of 27 cameras, all three-tube, lead oxide type (including 4 RCA TK-44A in Turin), 13 VTR's (including 9 RCA TR-70 A & B), 14 telecine chains (16 and 35 mm).

With regard to transmitting equipment, the network of the Second Programme is being modified for color broadcasting, which will be radiated on VHF frequencies. RAI is making every effort to keep abreast of progress in the field of color television by exchanging information with foreign broadcasting organizations that already produce color television programs.

Communications by satellite

The installation and operation of earth stations and their associated telecommunications systems in Italy is the province of a bureau called "Telespazio-Societa per Azioni per le Comunicazioni Spaziali." In 1965 Telespazio joined Intelsat, the international association for the commercial operation of the world communications satellite system, and has a permanent representative on its administrative committee. Telespazio has an earth station situated in Fucino Valley, which works simultaneously with the Atlantic and Indian Ocean satellites to provide linking—including television—with USA, Canada, Mexico, Argentina, Brazil and all other earth stations in Latin America, as well as with ground stations in Asia, Africa and Australia.

Foreign relations

RAI cooperates with international organizations and foreign agencies in all aspects of broadcasting, particularly the European Broadcasting Union (EBU). It also belongs to the International Telecommunications Union (ITU) and the International Special Committee on Radio Interference (CISPR). In addition relations have been maintained for many years with the Council of Europe and UNESCO.

One of the main facets of RAI's relations with foreign broadcasting organizations is the exchange of programs. This is accomplished both by international system interconnections and by the interchange of recordings. On a per annum basis direct feeds exceed 6,000 and recordings 4,000. The trade of TV programs is mainly via the Eurovision network of Western Europe and the Intervision system of Eastern Europe and Russia. The daily flow of Eurovision news films and the one-way link-ups which allow foreign correspondents to send in their reports, are among the most important Eurovision connections. In a typical year over 1,700 of these bilateral interviews are performed, supplemented by the interchange of more than 1,300 filmed and videotaped programs.

A number of special programs are produced for broadcast in foreign countries, particularly those in North and South America. Distribution is handled by RAI Corporation of New York and the RAI office in Montevideo. RAI is also increasing the production of special programs for local broadcast to Italian workers in Western Europe. Finally, RAI renders much assistance to broadcasting organizations in other countries, particularly those of developing ones.

Mention must also be made of the "Italia Prize," an international competition for radio and television works established at Capri in 1948 by RAI. RAI administers the permanent office, supported by a membership of 40 organizations, that awards The Prize. The festival provides for the disbursing of nine prizes, six for radio and three for television works, by several international juries that sit in a different Italian town each year. A special prize for television works is also presented by the sponsoring town. ■


RCA

RCA has inaugurated a brand-new broadcast equipment manufacturing facility on Jersey, Channel Isles. Transferral of administrative operations from the previous location in the center of St. Helier, the island's capital, to the new site at Rue des Pres Trading Estate was begun by RCA Jersey Limited during the latter part of August. Production lines and test bays were implemented soon after. Now, assembly of TR-70C Video Tape Recorders and production of new and reconditioned headwheel panels is in full swing.

Eighty kilometers from the English coast, the Channel Islands, Jersey, Guernsey, Alderney, Herm and Sark, are today the only reminder that England once possessed a great deal of France. Jersey, the largest of the isles, is 15 Kms long by 10 Kms wide and is renowned for its magnificent stretches of bathing beaches. The short distance to England and its even closer proximity to France, 20 Kms, spurs an influx of tourists and vacationers who make its airport one of the busiest in Europe. During the height of the season, Jersey's permanent population of 70,000 more than doubles.

A new factory in Europe was visualized several years ago as the best method for RCA to bring technically advanced video tape equipment to broadcasters in the United Kingdom, Eastern and Western Europe, Africa and Eastern countries as far away as India. This vast territory is the sales responsibility of RCA International Marketing S.A., Geneva, Switzerland. RCA broadcast products were first represented on Jersey in 1966, when a small shop to supply reworked highband and lowband video tape headwheels for the RCA VTR's of stations in the Geneva area was established. This operation was quite successful in attracting new users of RCA VTR's and in sustaining RCA's reputation for providing complete and rapid spares and service support.

In 1969, RCA decided to build the new production center, to enable customers to benefit from lower freight costs, "EFTA" trading allowances and the excellent performance record that the headwheel operation has acquired. The island itself offers distinct advantages: it has designated the area where the new factory is located as a "trading estate" (industrial park) in order to encourage the development of light industry to supplement tourism, the basic and major employment activity for indigents.

The several technical and business colleges nearby have provided RCA with many of its engineering, staff and production personnel. In fact, RCA and the institutions sponsor a joint program that offers recent graduates and other employees the opportunity to select additional studies to improve their vocational abilities. In addition, RCA has met with considerable success in employing local personnel some 30% of whom are female. The enthusiasm and energy of this youthful group complement the experience and expertise of Jersey's management, engineering and production staff, most of whom are from the United States or England.

Ground-breaking ceremonies for the new edifice were co-hosted by I. K. Kessler, RCA Executive Vice President, Government and Commercial Systems and Sir Robert Le Masurier, DSC/Bailiff and highest official on Jersey on August 6, 1970. The building was completed within one year, exactly on schedule and soon landscaping will be completed on the 1.07-hectare plot. The reinforced concrete structure is strikingly modern in design and since the walls around the main entrance are covered with roughly-textured unpointed Jersey granite, while the side walls are of "Brolac Weathercoat," it presents a very natural exterior to the onlooker.

Overall it provides 3,000 sq. mts. of office and production space. Adjacent grounds supply ample room for employee parking, shipping and receiving. It is configured to satisfy the three functional areas and to permit future expansion. A two-story office and administrative block, including the plant dining room is linked by a corridor stairwell to the double-decked manufacturing wing. The production section houses assembly areas, stores, material handling and traffic departments. All video tape recorder assembly and test is performed on the first floor, while the second floor, a smaller space positioned over the middle of the building, sustains headwheel production and refurbishment. It is subdivided into two parallel rows of cubicles separated by a center aisle, to provide a headwheel panel assembly line. When it becomes necessary to increase production facilities, 500 sq. meters may be added to the second floor by building over the roof of the first floor, thus equalizing the upper and lower work areas.

The building is not air-conditioned, since Jersey's mild climate has a peak summer temperature of approximately 24° C. However, a unique airflow scheme provides filtered air which is maintained at uniform levels by automatic thermostats located in each department. This ventilation system is designed to readily accommodate air-conditioning should it be required in the future, but even now, it assures the stable, dust-free environment essential for the production of video tape equipment, some of which requires tolerances of 16 millionths of a centimeter.

Although Jersey is supplying initially only TR-70C VTR's put together from sub-assemblies provided by RCA Communications System Division in Camden, plans are being formulated for the actual production of various TR-70C modules there. It is anticipated that manufacture of audio modules and perhaps the entire servo drawer will commence on the isle sometime during the first quarter of 1972. Other circuits will be added to the production lines in due course. Present schedules call for the delivery of a quantity of complete TR-70C's this year to UK and European customers. The first units assembled were shipped to WDR in West Germany, during the third quarter, while several others were sent to the ORTF in Paris. However, during 1972, output should be considerably increased with a concurrent rise in the proportion of the machine to be fabricated in the Rue des Pres works.

The plant has the capacity to produce several hundred new and reconditioned headwheels per month; however, production is programmed to support market needs and will vary accordingly. Jersey serves all Geneva-area requirements and also ships a substantial number of headwheels to stations in the U.S. and throughout the world. ■

Fabrication of video head portion of headwheel panel.

Measurement of tracking dimension.

Slip-ring assembly and concentricity adjustment.

Returned headwheel panels in rehabilitation process.

Comprehensive system testing of assembled TR-70C.

Headwheel panel final calibration and inspection.

TK-44B Color Camera Offers a New Dimension of Creativity and Performance

Unique Production Features Improve Programming Flexibility

TK-44B Offers New Features

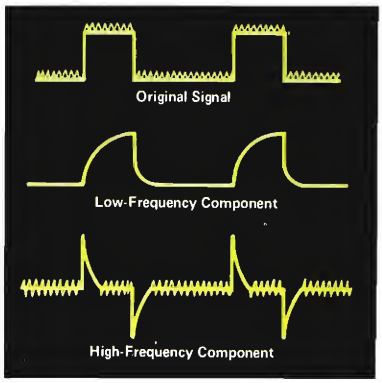
Broadcasters can now order a better color television camera from RCA for their studio and OB applications. A continuing engineering program has brought forth a range of built-in features and an optional accessory that can be incorporated into the basic TK-44 format. Now the latest of this world-famous camera series contains facilities that inject an added dimension of realism into color pictures and provide extended programming flexibility to video directors.

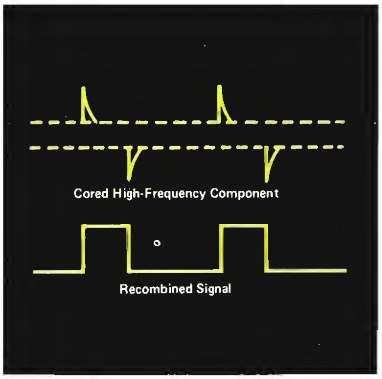
The new camera, called the TK-44B, has demonstrated at many exhibitions and stations that it consistently achieves the best reproduction of color scenes. With its increased performance and capability levels, it remains the industry standard. Here is a summary of the TK-44B's new features and the effect they have on the color picture.

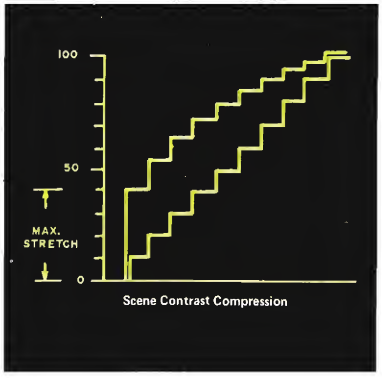
Bias Light

From a practical standpoint, the maximum useable sensitivity of lead-oxide pickup tubes is limited by lag. This disturbance, which appears in the picture as a smear on moving objects, increases sharply as the illumination on the tube is decreased. Movement in scenes must, therefore, be restricted as the light level becomes less, if such adverse effects are to be avoided.

Lag in the TK-44B is effectively reduced by the addition of bias light. This corrective factor, a fixed uniform illumination applied to the face of each pickup tube, results in higher signal current and, therefore, less visible picture distraction. It is introduced through the prism of the TK-44B by means of a unique reflective system. Bias light can be turned on or off with a single 3-position switch and no other adjustments are necessary. These settings are: 1. bias light off, 2. bias light on with normal video gain and, 3. bias light on with 9 dB additional video gain. The third stop permits instant modification of video gain in each channel, for operation at extremely low light measurements. Black level is automatically changed to maintain the proper balance under all three operating conditions.







RGB Coring

Having greatly reduced image distortion through the use of bias light, smear on moving objects no longer limits the maximum sensitivity of the camera. Scene lighting can now be reduced and the video gain raised to achieve full video level. The amount of additional picture power which can be utilized is obviously limited by noise.

RCA has developed a noise reduction system known as RGB coring. The individual RGB signals (fig. a) are divided into their low frequency (fig. b) and high frequency components (fig. c). The latter quantity is symmetrical, with the high frequency noise appearing on the base line. This interference is cored or stripped from the baseline of the high frequency parameter. Recombination restores the original signal less the high frequency noise.

RGB Coring reduces high-frequency noise so that more video gain can be employed as the light level decreases — effectively increasing the maximum useable sensitivity of the camera. Full amounts of video can now be obtained with scene illumination of only 5 footcandles.

Scene Contrast Compression

The Scene Contrast Compression system developed for the TK-44B brings out picture detail which may be hidden in the dark areas of the scene. This facility is particularly applicable for outdoor use where lighting cannot be controlled and the point of interest is in the shadows. Operationally, it functions as a true contrast regulator, similar to that control on a television receiver.

The important characteristic of the RCA Scene Contrast Compression system, is that the camera can be set-up for normal pickup tube signal currents with peak white at 100% and a 2:1 beam reserve to discharge picture highlights. Optimum performance under normal lighting conditions is not compromised to accommodate changes in lighting due to cloud cover or diminishing sunlight.

To accommodate portions of the picture


RCA

Monitor scene left, without contrast compression. Same scene at right, with contrast compression.

within shadow areas in a scene, a luminance signal derived by matrixing the RGB components is amplified and black-stretched. The amount of black stretch is continuously variable. The chrominance values are then multiplied by the modified luminance segment, raising the gain in the dark portion of the picture. This multiplication technique maintains color balance since the hue signals precisely follow the change in luminance gain. The Scene Contrast Compression circuitry provides a single, continuously adjustable selector which varies the camera transfer characteristic gain at low light levels to bring faint scene details in a high contrast situation into the effective operating range of the television system. Single-knob control is easily accomplished.

Scene Contrast Compression enhances the performance of the TK-44B under adverse field and studio lighting conditions. Objects in the shadows can now be clearly reproduced without affecting picture quality in the highlight areas of the scene.

Dynamic Resolution Accessory

Television resolution charts, as normally employed, define static resolution. In conventional TV camera systems the definition of items in the scene will deteriorate with motion. This is due to the basic fact that 1/60 sec. exposure for each television field in NTSC systems, or 1/50 sec. in PAL systems is not a minimum period to eliminate smear on moving objects. This inherent problem becomes quite evident when stop-motion or freeze-frame techniques are employed. This defect is readily apparent to anyone who has watched a football player catching a pass in the end zone, or a soccer player scoring a goal, on a stop-motion recorder.

Even more important than stop-motion television, which is of primary interest to stations that use disc tape recorders, is a problem common to virtually all stations that employ chroma key in their studio productions. The loss of resolution or motion smear causes the chroma keying signal to deteriorate. Consequently, movements of performers are restricted if an undistorted chroma keying signal is to be achieved.

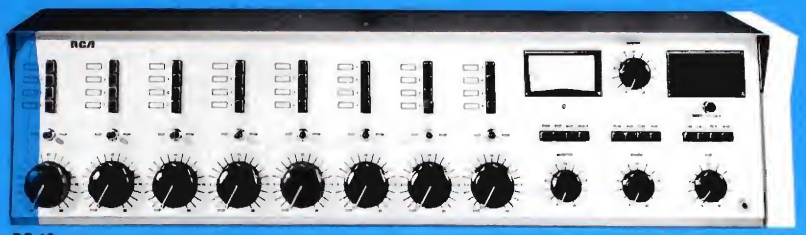
In order to solve these major production problems, RCA has developed an accessory for the TK-44B which permits a real exposure time of 1/240 sec., on NTSC and 1/200 sec. in PAL. This effectively reduces the subject motion by a factor of 4 to 1. The improvement is accomplished by installing a phased synchronous shutter in the optical system. With this device stop-action pictures become accurate and clear. Chroma keying is precise without ragged edges from scene movement.

Conclusion:

The new features incorporated into the TK-44B expand its performance capability under a wide range of operating conditions. Quality pictures can now be produced under restricted lighting situations which heretofore have been considered to be inadequate for television pickup. The TK-44B opens up new possibilities for studio work as well, giving greater provision to handle creative lighting effects. Equipped with the Dynamic Resolution Accessory, the TK-44B can telecast startling fast-motion chroma key scenes and sharp stop-action recordings. ■

New Medium-Priced Audio Consoles

BC-15



BC-18

The BC-15 and BC-18 consoles represent a breakthrough in medium-priced control centers for broadcast and other professional audio applications. They offer such deluxe features as step attenuators, with cue preamplifiers and transformers for every input, audition bus, speaker muting and talkback circuitry. The BC-18 has eight input mixers, while the BC-15 has five and each is available in monaural, dual-channel monaural and stereo versions. Thus, a variety of models exist, to supply the capability desired by most broadcasters. Both units function in a simple, precise maner . . . a description of the circuit paths of the monaural versions follows . . . the other options operate similarly:

Input Signal Selection

The incoming signal to the first four mixer-attenuators in the BC-18 (or the first three in the BC-15) is controlled by an interlocked pushbutton switch. Use of the uppermost section of the switch applies a single, high-level voltage (—10 dBm nominal) to the front-end preamplifiers. When either of the three other switch sections is depressed, a low-level microphone insertion (—50 dBm nominal) is selected. Thus, each mixer can accommodate inputs from three microphones and from a driver with a higher value. If necessary, an attenuator pad can be installed to create an additional high-level intake from one of the microphone entries. The same types of inter-locked selectors are used to route high-level feeds from other equipment to the appropriate input preamplifier circuit and to the last four mixer-attenuators in the BC-18 (and the last two in the BC-15).

Preamplifier Modules

All inputs advance through transformers and preamplifiers to their respective mixers. The solid-state, low-level, preamplifiers provide a gain of 40 dB by accepting a source impedance of 250 ohms and terminating it with a minimum of ten times its initial value. At high-levels, a bridging pad is inserted between the exterior switch and the first-stage transformer on the preamplifier.

Cue Bus

The mixer-attenuator is scaled in twenty 2 dB graduations within its full range of 40 dB and provides a positive-acting cue position when rotated in a maximum counterclockwise direction. In the cue mode the attenuator energizes the four-section CUE switch beneath the console loudspeaker. When the CUE button is depressed, the signal is sent to the cue amplifier, CUE level control and the loudspeaker. All attenuators thereby have access to the cue bus whenever the switch is rotated fully counterclockwise. The importance of this feature becomes apparent when grammaphones and tape recorders are cued and when microphone connections have to be checked.

Audition Bus

The three-step switch above each mixer-attenuator is actuated to choose the audition or program bus, or OFF, for the input to the preamplifier. When in the AUD (audition) condition, the signal network includes the audition bus, the monitor amplifier and the MONITOR control under the VU meter.

When the audition pushbuton is depressed, its amplified emission is conducted via the MONITOR level control to the 10-watt monitor booster. Several feeds emanate from this device: one is for muting (when a microphone is used); a second provides an unmuted speaker link; and a third delivers an audition line output (transformer an optional extra).

Program Bus

When PGM (program) status is employed, the preamplifier supplies the program bus, program amplifier, MASTER level regular, output transformer and a 6 dB isolation pad. The flow from this circuit is also used in the program state to command the monitor-amplifier and the front-panel VU meter. An additional terminal at the program end permits recording or checking the source material.

Headphones

A headphone jack, located on the console for listening purposes, is activated by the PHONE selector beneath the MASTER level control. It has a wide-range, variable-gain amplifier, adjusted by the PHONE level control.

Mains Supply

The consoles can be served by a 110/220-volt, 50-60-Hz mains. Maximum power consumption is approximately 110-watts. ■

Managing Multi-Station TV Antenna Projects

By R. L. Rocamora, Manager
Antenna Engineering
& Product Management

John Hancock Center dominates Chicago skyline.

Introduction

The number of TV antenna systems serving several stations is steadily increasing throughout the world. This trend is particularly noticeable in the United States, where previously, each television broadcaster established his own transmitting site. The new practice, though, sees them co-locating on antenna farms and where feasible, sharing the transmitting plant. Each participant now has new requirements . . . he needs an individual aerial that must occupy the same support structure with others and yet provide an efficient radiation pattern. Obviously, this means the design of complex, inter-related elements, which can be expensive because of their intricacy. Despite all of this complexity, however, co-located TV antennas can be economical, especially from manufacturers having a variety of standard designs.

Most co-sited antennas in the United States consist of independent units—stacked vertically, or mounted side-by-side, or in combinations of both, instead of multiplexing several services on a single antenna. This is primarily because the participating stations are normally private enterprises vying for the same audience. They are gravely concerned about position on the tower, access to their antennas, reliability, maintainability, transmitter output power, antenna gain and coverage area. Since the resolution of these parameters may be influenced by politics or economic factors rather than technical considerations, sometimes one or more of the radiators are placed in less than their ideal location on the mast.

These factors tend to complicate the electro-mechanical problem of the antenna developer and require him to exercise utmost ingenuity to comply with each broadcaster's performance needs. To a large degree, this explains the variety and number of antenna types that have been developed in the U. S., and the creation of the business structure with the resources to fabricate, test and install major "turnkey" systems.

Earliest Multi-Station System

The first large scale TV antenna in the United States was the five-station, vertically-stacked, array for the Empire State Building in 1952. This complex used combinations of the two existing antenna types — the upper antenna was a Channel 4 (Band I) Superturnstile, while Channels 2, 5, 7 and 11 (Bands I and III) were half-wave dipole panels, a species that is relatively obsolete.

Vertically-Stacked Antenna Systems

Today, the five original stations, plus four subsequently added, have agreed to move their transmitting facilities to the World Trade Center Building. At this location, they will be joined by another station to share a completely new antenna system that is scheduled for commissioning this year. Eight main and five standby antennas (Fig. 1) serving 10 television stations and providing a master, multi-channel, FM circulary polarized antenna (Band II) make it one of the largest multi-station plants in the world.

As on the Empire State Building (Fig. 2) the highest antenna on the new skyscraper is a Superturnstile, but instead of being a single-TV channel type it will be diplexed for Channels 4 and 5 (Band I). The Superturnstile design has been one of the most popular in the U.S. due to its simplicity, durability and stability and because it can be used for multiplexed applications.

Supporting the Superturnstile is a square, radome-enclosed, zig-zag panel antenna for Channel 11 (Band III). Also called a "Zee Panel", it has one feed point per panel face and when mounted on a moderately-sized mast can offer a circularity of better than ± 1.5 dB. It can support other antennas, since its main frame is similar to a tower section.

Under the Channel 11 "Zee Panel", is a radome-covered Butterfly panel antenna diplexed for Channels 9 and 13. This antenna can serve up to four channels in Band III, because it has a natural bandwidth of 80 MHz. Its horizontal and vertical patterns are excellent, whether it is mounted on three-sided or four-sided towers.

A pentagonal zig-zag antenna for Channel 7 (Band III) is emplaced beneath the array for Channels 9 & 13. This unit is also housed within a radome. Its horizontal pattern circularity is within ±1 dB.
On the next lower level, another Butterfly antenna for Channel 2 (Band I) shares its aperture with a UHF antenna. This Channel 31 (Band IV) array uses three V-shaped, zig-zig, radome-enveloped radiators known as Vee-Zee panels (Fig. 3), that are mounted on the three corners of the tower and fire tangentially. Aperture-sharing allows separate antennas for each broadcaster and based on model tests, has negligible effects on the performance of either. The Channel 31 Vee-Zee can accept RF inputs approaching 120 kilowatts.

The remaining aperture below the Butterfly and Vee-Zee elements is divided between two vertically-stacked UHF antennas for Channels 41 and 47 (Band V). These are special, Mark III, full-wave dipole panel types (Fig. 6) specifically developed for each station assigned to this larger-diameter portion of the mast. The Channel 41 bay has three layers and the Channel 47 four layers of 16 panels around the tower. Each panel contains 6 dipoles and a strip-line feed system. Since the programs of the stations are intended for certain viewers, both antennas are directional and contoured to cover different geographical areas (Fig. 5). Each Mark III is capable of radiating approximately five megawatts peak power from 150 kW of input power.

The lowest part of the tower supports several standby Butterfly antennas and a custom, circularly-polarized FM (Band II) array that is designed to radiate signals from 15 FM stations in the 88-108 MHz range (Fig. 4). It consists of two strata of panels, spaced four-around the tower, providing an aerial with unity gain and a maximum power handling capacity of 5 kW per input.

Other Methods of Stacking

There are approximately 10 U.S. installations using antennas erected side-by-side on the same platform. An example is the three-station UHF Pylon system operating in Boston, Massachusetts. Pylons have an inherent circularity of better than ±1 dB and when they are used together on different frequencies, the change of their horizontal waveform due to interaction is only about 1.5 dB, depending on their spacing.

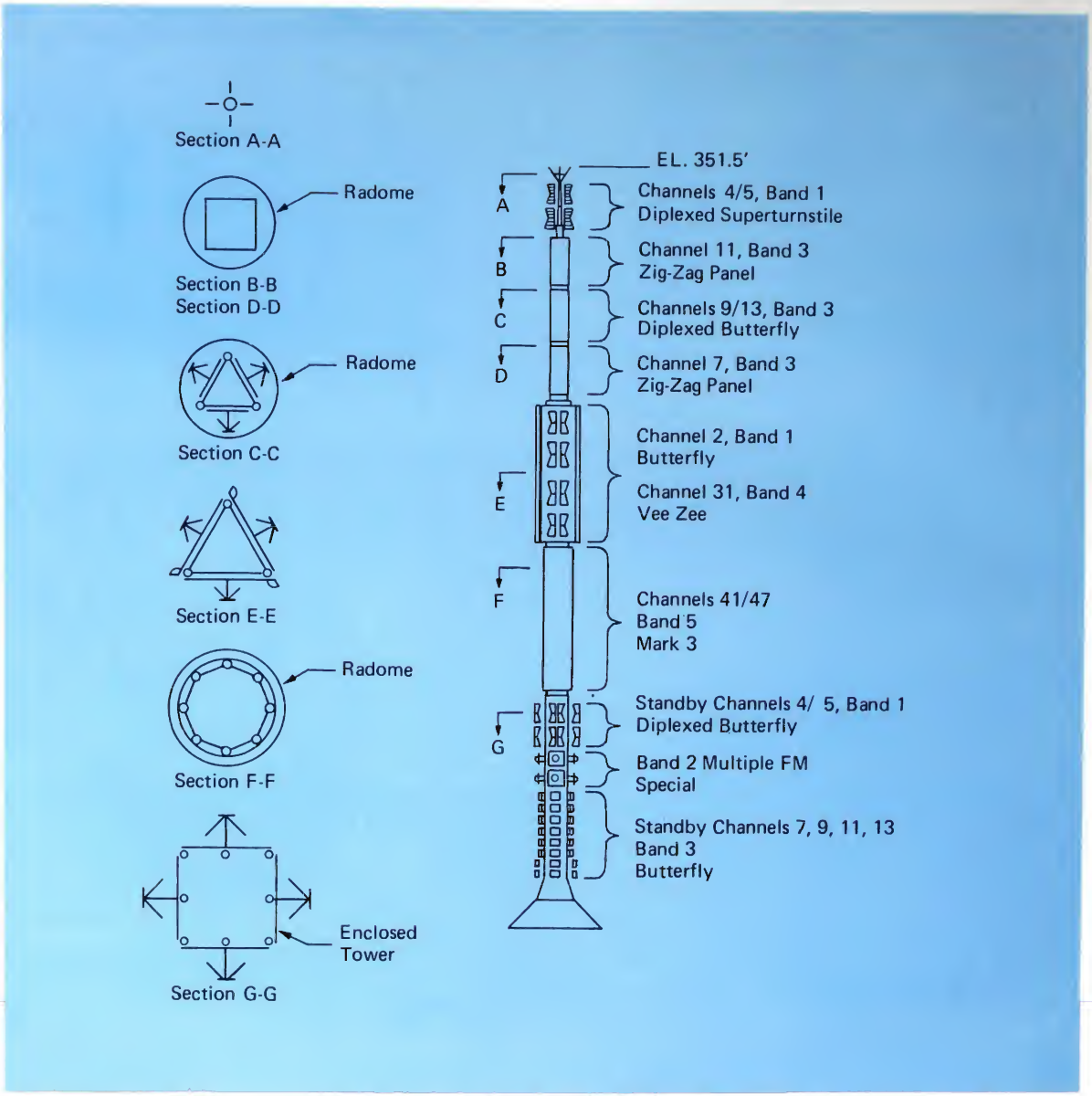
Traveling-Wave (Band III) and Superturnstile models (Band I and III) are also commonly set laterally (Fig. 8). The Traveling-Wave concept combines gain and power handling attributes with small silhouette, simplicity and strength. As with the Pylon, the reduced profile of Traveling-Wave and Superturnstiles when mounted broadside on the same base, minimizes the scattering of the intercepted signal and thus the horizontal pattern degradation. Also, their normally null-free, vertical beam which provides excellent close-in coverage is maintained.

Combined Horizontal and Vertical Stacking

A large antenna system that has been operating successfully for two years atop the 100-story John Hancock Center Building in Chicago features groups of antennas mounted on twin spires 30-meters apart. The cluster presently serves six stations, but there is space on the assembly for the addition of four more antennas. In developing the final arrangement for the Center, the performance of prototypes was computer-analyzed during a two year study to evolve antenna pattern characteristics responsive to each broadcaster's coverage requirements. The tower sway tolerance had to be within 0.5 degrees in winds up to 80 km/hr and the circularity of all of the omnidirectional antennas had to be approximately ±2 decibels. The upper two UHF antennas were directionalized polygons with patterns maximizing coverage over the population areas.

This was the first implementation of the Band IV and V Polygon (Fig. 7), an integral five-sided structure that supports zig-zag elements. They can be designed for omnidirectional service with power gains of up to 60, power input ratings up to 220 kW and are readily directionalized. The Polygon is fabricated from steel and is built to be mounted at the top of the mast or integrated with it to hold other antennas. Its discrete gain units are emplaced vertically, with the five faces of each section being fed from a single point by means of a strip line. All feeders are internal to minimize protruding elements and make installation easier.

Fig. 1



Engineering an 11-Station System

Typical of high-density, multi-station schemes is the complex under construction on Mt. Sutro near San Francisco (Fig. 9). This was a most involved project and one that emphasized the contribution of a large and experienced engineering organization. The final configuration is a triangular disposition of three antenna stacks mounted on 30-meter centers, creating space for seven antennas serving eight stations. Other TV and FM antennas may be added in the future.

Mount Sutro's conception began with an 18-month technical study to discover how the greatest number of antennas could best be mounted on top of the tower. Each station was to be given a separate antenna and none were to suffer any signal impairment due to their proximity. One of the first packages seriously considered was comprised of a tier of seven antennas, four of which would support a second level of antennas. A computer plot of the horizontal performance of each antenna in the presence of all of the others was verified by 10:1 scale model tests.

But further evaluation was necessary and finally it became apparent that three stacks of antennas on a single deck would perform best: first, a diplexed Superturnstile above a single-channel Superturnstile; then a Traveling-Wave antenna on top of a Polygon; and finally, a Traveling-Wave over a Polygon which in turn is supported by a Polygon. The towering formation can withstand an earthquake movement of approximately 8.3 magnitude, relative to a Type A model of simulated ground motions', the most severe forecasted for California within the next 100 years. The recent earth tremors dramatized the necessity of including this environmental ingredient when structures are to be located in regions subject to periodic shocks.

Multiplicity of Antenna Types Required

Obviously, the individual signal requirements in a multi-station system can be fulfilled only when a variety of special

'"Simulated Ground Motions" published by Jennings, Housner and Tsai (1968).

Fig. 2

Fig. 3

Fig. 4

Fig. 5

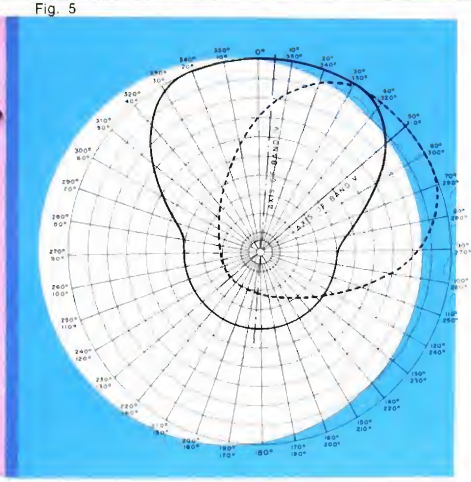
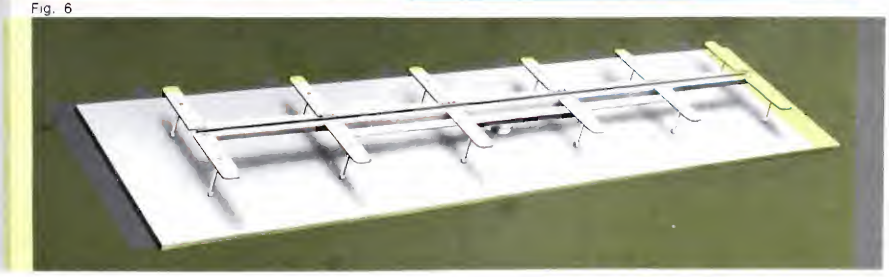


Fig. 6



purpose radiators are available—where there is an antenna type for virtually every application. Several families of TV antennas and their variations have been developed and are currently in use (Fig. 11). The Pylon class, for example, now includes 21 types.

A Functional Preparation Diagram

A new undertaking for several stations could be processed in three stages.

First, the collaborators would agree to use a common site. Then they would furnish bidders with such criteria as horizontal and vertical pattern requirements, desired fill, antenna ERP, etc., to help determine an appropriate tower and the placement of individual aerials.

Next, the prospective builders would prepare preliminary specifications for each channel, using existing antenna types or new models.

Various stacking formats may be evaluated so, ultimately, several options become available for final selection.

In the last step, the bids are received and compared and the broadcasters choose the most responsive proposal.

The successful firm would proceed with construction, test and adjustment of the system at its antenna works.

Typical Management Organization

Profitable involvement in these elaborate schemes requires a company conversant with all aspects of the industry. Typically, it must devote a staff of 50 to 150 craftsmen, engineers, draftsmen, fabricators, administrators, erectors and field service personnel to the performance of propagation studies, antenna design and development, manufacture, field installation, and service and acceptance testing.

Planning and marketing would be the aegis of a business management group able to implement and administer associated contracts, control inventory and validate warranty.

Computerized Operation

Computer reports must be distributed to participating engineering sections and to key executives to ensure maximum

utilization of all expertise. Remote terminals connected to large scientific computers must be made accessible to technical personnel to expedite their assignments.

Production and Test Center

Besides a manufacturing plant, a typical antenna production facility should incorporate an experimental pattern range in order to permit simulated operation of fully integrated units. Once the antennas have been properly tuned at the factory, they can be dismantled and shipped in one or two sections, thereby enabling recipient stations to emplace and commission them with minimum installation time and expense.

At least three large turnlables capable of accommodating structures of many different sizes and shapes should be available. One of them would be used for pattern-testing and should be able to hold frames weighing up to 32 metric tons (Fig. 10). A circularly-polarized FM-unit is shown undergoing a polarization test, with the aid of a tri-axial turntable.

Pylons are pattern-tested at this engineering facility to assure proper field performance. Traveling-Wave and Super-turnstile types, however, have continuously evidenced proper pattern performance and therefore do not require such tests. The Traveling-Wave is adjusted after measuring attenuation, phase and amplitude on a special 122-meter trestle (Fig. 12). It is tuned in accordance with procedures devised several years ago as part of an engineering development program.

Project Management Methods

Project management responsibilities includ the provision of hardware, field installation and systems acceptance tests. To accomplish these objectives within the specified time period, the supplier must be experienced in all phases of administration and implementation. Several modern techniques have been institutionalized to assist management coordinate and control its contractual obligations. The "Critical Path Method" (CPM) to monitor the overall project and the "Line of Balance" (LOB) discipline to supervise completion of individual products are two of them. The critical path concept programs and sequences each task including the assign-

Fig. 7

Fig. 8

Fig. 9

ment of manpower and equipment, for each phase of the project. This rationalization generates a series of finite figures, which are added and matrixed with a time schedule for design, delivery of material and system completion. This grand total is fed to a computer which calculates a "critical network" to guide progress, complete with starting and ending dates for each activity. A key benefit of the CPM is that potential delays are illuminated in advance, so alternate plans can be devised.

The "Line of Balance" formula permits management to establish a reliable and definitive procedure for overseeing all details at the material fabrication level. Its output is incorporated into the CPM system for overview of the entire project.

Installation and Performance Testing

After the entire structure has been erected and coaxial lines have been connected, finally calibration of each transmitting system is made by the station's engineers, supervised by specialists dispatched by the manufacturer. Several tests are very important, those for proper VSWR, mutual coupling and reflections. The latter condition can be measured by an RF pulse technique[1] using a vestigial sideband waveform to simulate the television signal. Figures of merit are less than 2% for a "bar" pulse and less than 3% for a 2T pulse in the vision frequencies and less than 5% in the color subcarrier region. Other examinations are conducted as required.

Conclusions

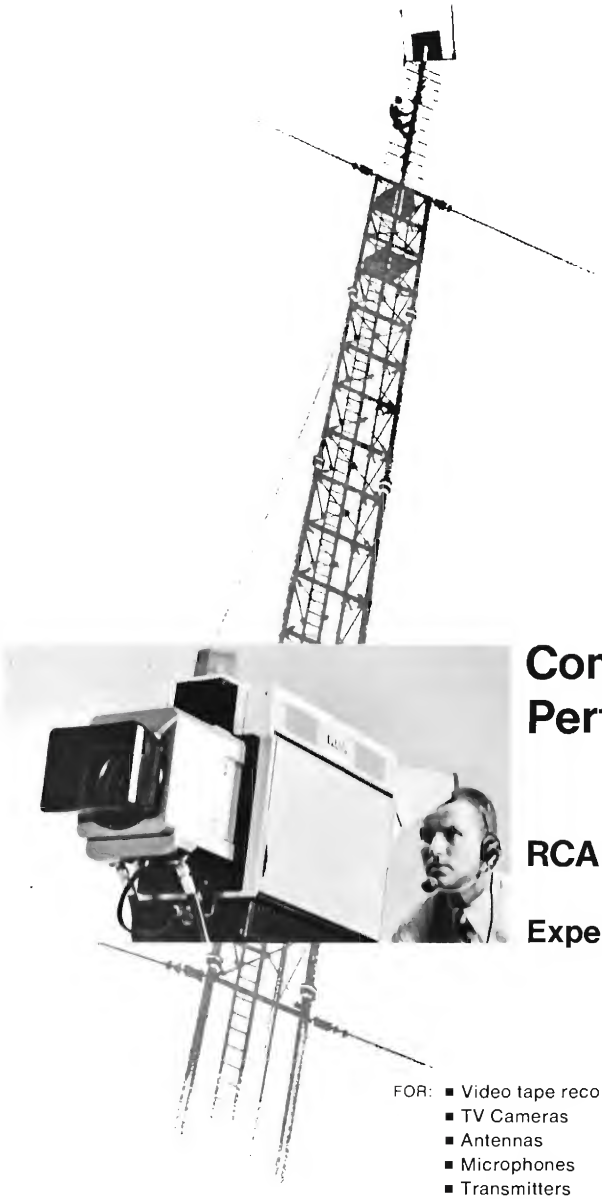
The provision of multi-station TV antenna systems calls for extensive manufacturing and test facilities complemented by considerable long-term experience in analyzing the efficacy of multiple station projects. The management of such intricate undertakings is best accomplished by an organization qualified to design, develop, fabricate and install the antennas. The factory departments should be augmented and represented by a field service corps familiar with the total theory and practical application of television transmitting systems.

[1] "TV Antenna Performance Evaluation With RF Pulse Techniques" by Dr. M.S.O. Siukola, 1970 Transactions, IEEE Broadcast Symposium, Washington, D. C.

Fig. 10

Fig. 11

Fig. 12



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